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ULTRASONIC INSPECTION RESULTS FOR DOUBLE-SHELL TANK 241-AZ-102 - FY 2003

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U.S. Department of Energy Contract DE-AC27-99RL14047

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Key Words: Ultrasonic, inspection, exaination, UT, DST, slots, SAFT, T-SAFT

Abstract: This report documents the required ultrasonic examination of double-shell tank 241-AZ-102 performed during FY 2003. This examination included specified primary wall areas, welds, lower knuckle, tank bottom, and SAFT/T-SAFT examination. Results indicated that there were nine areas of wall thinning that did not exceed accepance criteria in plates 1 and 2 and no areas of cracking or pitting identified. An issue of insulating concrete spalling was reported via PER-2003-3006.

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ULTRASONIC INSPECTION RESULTS FOR DOUBLE-SHELL TANK 241-AZ-102 – FY 2003

C.E. Jensen

CH2M HILL Hanford Group, Inc.

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Ultrasonic Inspection Results for Double-Shell Tank 241-AZ-102 – FY 2003

August 2003

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FIGURES

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TERMS

ASME	American Society of Mechanical Engineers
CH2M HILL	CH2M HILL Hanford Group, Inc.
COGEMA Engineering	COGEMA Engineering Corporation
DST	double-shell tank
DSTIP	Double-Shell Tank Integrity Project
EPRI	Electric Power Research Institute
FY	fiscal year
HAZ	heat-affected zone
JCS	Job Control System
NDE	Nondestructive Examination
PDT	Performance Demonstration Test
PNNL	Pacific Northwest National Laboratory
PUREX	Plutonium Uranium Extraction Facility
RL	U.S. Department of Energy, Richland Operations Office
RONDE	Remotely Operated Nondestructive Examination
RMS	Root Mean Square
RUTI	Remote Ultrasonic Testing Inspection
SAFT	Synthetic Aperture Focusing Technique
T-SAFT	Tandem Synthetic Aperture Focusing Technique
TWINS	Tank Waste Information Network System
TWRS	Tank Waste Remediation System
UT	Ultrasonic Testing
WDOE	Washington State Department of Ecology

EXECUTIVE SUMMARY

Background

Through FY 1999, six double-shell tanks were ultrasonically examined to meet the integrity requirements of the Washington Administrative Code, Chapter 173-303, "Dangerous Waste Regulations". Subsequent to the examinations, integrity assessment reports were issued for each double-shell tank farm and submitted to the Washington State Department of Ecology in FY 1999. In June 2000, the Washington State Department of Ecology issued Administrative Orders 00NWPKW-1250 and 00NWPKW-1251 providing prescriptive examination requirements for all double-shell tanks by FY 2005. In 2003, the Administrative Orders were incorporated into the Hanford Federal Facility Agreement and Consent Order, Milestones Series M-48. Milestone M-48-11 requires examination by September 30, 2003, of four DSTs not previously examined. This report documents the required ultrasonic examination of double-shell tank 241-AZ-102, completed in the fourth quarter of FY 2003.

Methodology

The primary wall examinations consisted of a vertical 30-inch strip consisting of two 15-inch ultrasonic examination scans. The primary wall vertical examinations were looking for wall thinning, cracking, and pitting in the tank wall. The weld heat affected zones examined included 20 linear feet of vertical welds and 25 linear feet of horizontal welds. A portion of the lower primary tank knuckle was also examined for pits, wall thinning and cracking. These examinations were performed primarily using the P-scan nondestructive examination technique. A second technique, Tandem Synthetic Aperture Focusing Technique (T-SAFT), was used to examine the high stress region of the lower knuckle.

The ultrasonic examinations were carried out in accordance with ASME Boiler and Pressure Vessel Code, Section V, "Nondestructive Examinations". The personnel and non-destructive examination equipment were qualified to perform the examinations on the double-shell tanks by performance demonstration tests administered by Pacific Northwest National Laboratories.

The required accuracy for the ultrasonic examinations is to be within 0.020 inches for wall thinning, 0.050 inches for pitting, and 0.10 inches for cracking. The performance demonstration tests revealed that the examiners meet this requirement.

Results

Results indicated that there were six areas of reportable wall thinning detected during the primary tank vertical wall scans of Plate #2. A total of 8.1 square inches of thinned area was identified, ranging from 0.066 to 0.089 inches deep, or 13.2% to 17.8% wall thickness reduction. These areas of reportable wall thinning occurred in the vicinity of the liquid-air interface levels that have existed since August 1986.

There was no additional reportable wall thinning in any of the other plate areas examined. This included the remaining primary wall vertical scans and the lower knuckle horizontal scan. In addition, there were no reportable pitting indications nor any crack-like indications detected in any of the plates. This included examination of the lower knuckle for cracks using the T-SAFT system. A video from a camera located at the end of the retractable probe showed cracking and spalling in the air slots. The effort to inspect the tank bottom via the air slots was abandoned because the probe became temporarily lodged inside an air slot. Air slots were visually inspected on either side of Riser 090, but all of the slots showed some form of degradation. A management decision was made to halt further attempts to scan the tank bottom due to the possibility of the RUTI probe being permanently wedged between spalled concrete inside an air slot.

There were also no crack-like indications nor reportable pitting indications detected in any of the weld heat-affected zones. This included the primary tank vertical weld scans and the knuckle-to-shell horizontal weld scan. There were three areas of reportable wall thinning detected during the primary tank vertical weld scan of Plate #1. A total of 0.27 square inches of thinned area was identified, ranging from 0.041 to 0.063 inches deep, or 10.9% to 16.8% wall thickness reduction.

Conclusions

Based on the results of this examination, the material condition of the tank appears to be satisfactory for continued operation, pending results of the investigation of insulating concrete spalling, documented via Problem Evaluation Report PER-2003-3006 and the resulting DOE Occurrence Report RP-CHG-TANKFARM-2003-0039.

The tanks inspected to date are summarized in the following table.

Double-Shell Tanks Inspected Through August 2003

Double-Shell Tank	Inspection Year (FY)						
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
AN-101						x	
AN-102					x		
AN-105			x			(1)	
AN-106			x				
AN-107		x					
AP-101							x (3)
AP-103							x (4)
AP-105							x
AP-107				x			
AP-108				x		(2)	
AW-101					x		
AW-102						x	(5)
AW-103	x						
AW-104						x	
AW-105					x		
AW-106						x	
AY-101					x	x	
AY-102			x				
AZ-101			x				
AZ-102							x (3)

(1) Limited scope reexamination.
(2) Linear indication evaluated.
(3) Includes primary knuckle T-SAFT examination.
(4) Linear indication detected; A follow-up inspection determined that it is a small area of incomplete fusion.
(5) Primary knuckle T-SAFT examination only.

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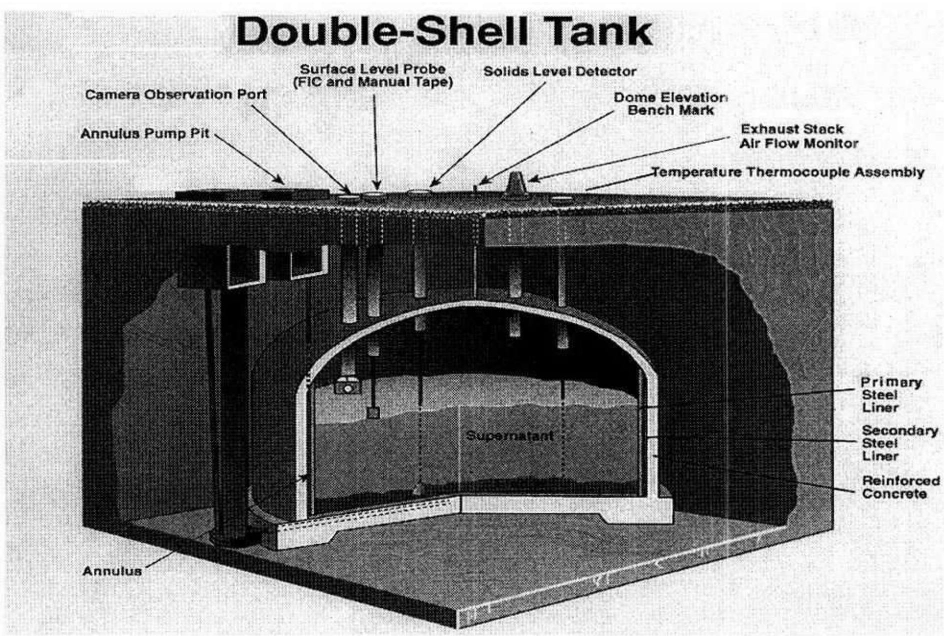
1.0 INTRODUCTION

In May 1996 the Tank Waste Remediation System (TWRS) Decision Board recommended, and U.S. Department of Energy, Richland Operations Office (RL) agreed, that the condition of the double-shell tanks (DST) should be determined by ultrasonic testing (UT) inspection of a limited area in six of the 28 DSTs (Figure 1-1). The Washington State Department of Ecology (WDOE) agreed with the strategy of limited ultrasonic inspection of DSTs. Data collected during the UT inspections will be used to assess the condition of the tank, judge the effects of past corrosion control practices, and satisfy a regulatory requirement to periodically assess the integrity of waste tanks.

Figure 1-1. Typical Double-Shell Tank Configuration.



In November 1996, DST 241-AW-103 was the first tank inspected to determine if Hanford DST walls could be inspected without removing the existing surface rust and scale. Equipment similar to that used to perform routine inspections of oil tanks and large pipelines was used. UT sensors were mounted on a remote-controlled crawler that used magnetic wheels to affix itself and move about on the tank walls. The crawler was deployed into the tank annulus and vertically traversed the primary and secondary containment walls to collect data on the wall thickness and the size of any pits or cracks. The successful completion of this inspection met the requirements of RL Milestone T21-97-455 and represented the first UT inspection of a Hanford DST (*Final Report - Ultrasonic Examination of Tank 241-AW-103 Walls*, Leshikar 1997).

In fiscal year (FY) 1998, FY 1999, and FY 2000, similar inspections were performed per Engineering Task Plans HNF-2820 (*Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks*, Pfluger 1999) and RPP-5583 (*Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2000*, Jensen 2000) on 241-AN-107, 241-AN-106, 241-AN-105, 241-AY-102, 241-AZ-101, 241-AP-107, and 241-AP-108. An attempt was made to examine 241-AY-101 in FY 1999, but corrosion product on the tank wall prevented reliable examination.

In June 2000, WDOE issued an Administrative Order requiring UT examinations of the remaining 20 DSTs through FY 2005 (*Administrative Order No. 00NWPKW-1251, Failure to Comply with Major Milestone M-32 of the Tri-Party Agreement*, Silver 2000). Based on the results of the above listed eight DST inspections and per WDOE Administrative Order requirements (Silver 2000), Engineering Task Plans RPP-6839 (*Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2001*, Jensen 2000a), RPP-7869 (*Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2002*, Jensen 2002), RPP-8867 (*Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks 241-AP-108, 241-AY-101, and 241-AZ-102 - FY2002*, Jensen 2002a), and RPP-11832 (*Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks - FY2003*, Jensen 2002b) were prepared for ultrasonic DST inspections scheduled for FY 2001, FY 2002, and FY 2003.

In FY 2001, UT inspections were performed on four DSTs: 241-AN-102, 241-AW-101, 241-AW-105, and 241-AY-101 (following cleaning of selected areas of the 241-AY-101 wall). In FY 2002, UT inspections were performed on five more DSTs: 241-AN-101, 241-AW-102, 241-AW-104, 241-AW-106 and 241-AY-101 (a more extensive examination of 241-AY-101). The FY 2002 examination of 241-AP-108 was limited to characterization of the linear indication found in FY 2000. In addition, a limited scope reexamination of the upper walls of tank 241-AN-105 was performed in FY 2002. A primary knuckle inspection on 241-AW-102 using the Tandem Synthetic Aperture Focusing Technique (T-SAFT) not completed during FY 2002 was completed in early FY 2003.

In 2003, the WDOE Administrative Order (Silver 2000) was incorporated into the Hanford Federal Facility Agreement and Consent Order Milestone Series M-48-11 (HFFACO 2003), requiring examination of four DSTs not previously examined.

DST 241-AZ-102 was the last of the four tanks selected for inspection in FY 2003 (the others being 241-AP-101, 241-AP-103 and 241-AP-105). Inspection of tank 241-AZ-102 was completed in the fourth quarter of FY 2003, and is the subject of this report. The services of COGEMA Engineering Corporation (COGEMA Engineering) were retained to provide UT examinations, procedures and inspectors, and report the inspection results. Examination of 241-AZ-102 was performed with UT equipment provided by CH2M HILL Hanford Group, Inc. (CH2M HILL).

2.0 OBJECTIVE AND SCOPE

This report describes the inspection system, evaluates the inspection results, and documents findings with conclusions and recommendations. The inspections were conducted in accordance with the criteria and scope set forth in RPP-11832 (Jensen 2002b) for the FY 2003 UT inspection of DST 241-AZ-102.

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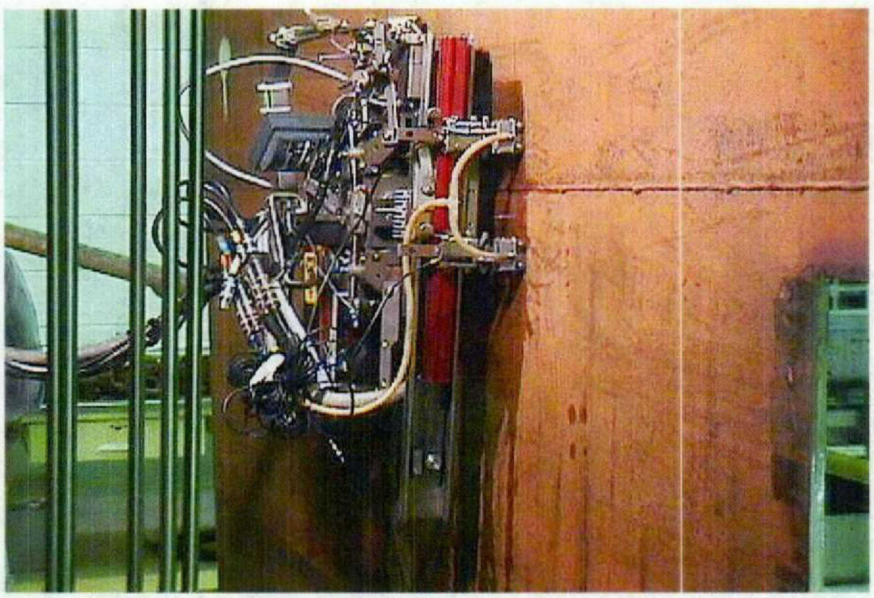
3.0 INSPECTION EQUIPMENT DESCRIPTION

Crawler / Scanning Bridge Systems – The crawler is a remotely controlled device that delivers the ultrasonic transducers to the tank walls. The crawler used during P-scan imaging weighs approximately 35 pounds and has dimensions (including its traveling bridge) of approximately 21 inches wide by 18 inches long by 6 inches high. The traveling bridge on the crawler can be outfitted with various ultrasonic transducer configurations (Figure 3-1).

Figure 3-1. P-scan Crawler System on Tank Mock-up.



The same type of crawler was used on a remotely operated nondestructive examination (NDE) system which utilizes the Synthetic Aperture Focusing Technique / Tandem Synthetic Aperture Focusing Technique (SAFT/T-SAFT, hereafter referred to as the T-SAFT system) to examine the primary lower knuckle region for cracks. The crawler and its traveling bridge has dimensions of approximately 18.5 inches wide by 47 inches long by 9.5 inches high, and weighs approximately 75 pounds. The traveling bridge on the crawler is outfitted with two ultrasonic transducers (Figure 3-2).

The tank bottom is inspected along the air slots using the Remote Ultrasonic Testing Inspection (RUTI) crawler deployment system (hereafter referred to as RUTI). This system consists of two crawlers that are coupled together with a boom assembly. Each crawler is approximately 14 inches wide by 24 inches long by 14 inches high, with an overall length of approximately 60 inches. It weighs approximately 350 pounds (including the deployment tool). One crawler unit contains the push-pull mechanism while the second unit contains the deployment mechanism for the UT P-scan probe and camera. The camera is first used to view the air slots for condition and obstructions. Then the camera is changed out to the UT probe and is redeployed into the tank annulus space. The UT assembly is pushed into the air slots using a flexible cable. The cable drive mechanism has an encoder that gives real-time status of the distance the UT probe has traveled. The UT probe is attached to the tank bottom via strong magnets. The probe has wheels that allow it to traverse the bottom with minimal resistance. The UT probe is outfitted with two ultrasonic transducers (Figure 3-3).

Figure 3-2. T-SAFT Crawler System on Tank Mock-up.

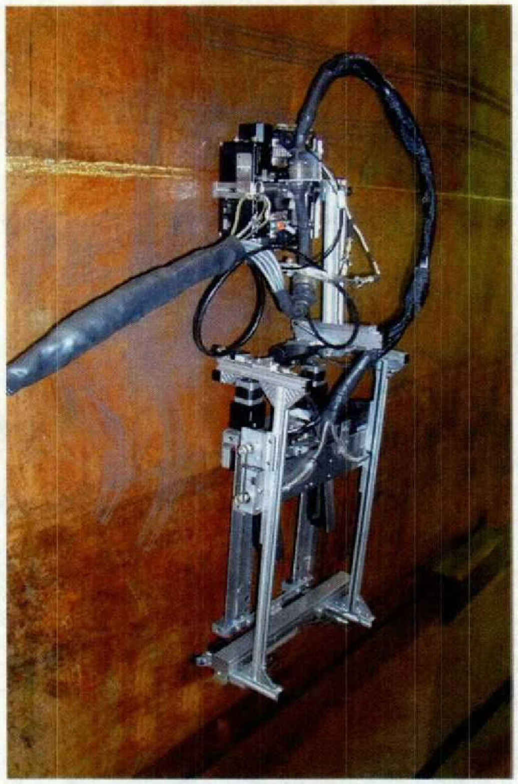
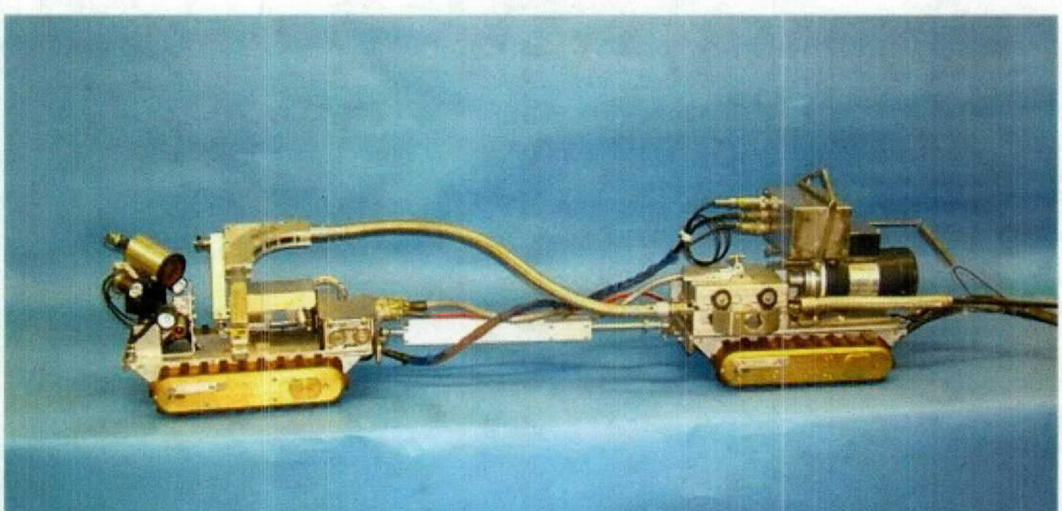


Figure 3-3. RUTI Dual-Crawler System for Tank Bottom P-scan Imaging.



All three crawler systems are deployed through a 24 inch annulus inspection riser using customized deployment tools. The P-scan tank wall crawler and T-SAFT crawler attach to the tank wall with two pairs of magnetic wheels. As the crawler moves slowly forward the transducers glide from side-to-side over the tank wall surface. The tank bottom RUTI system is driven onto the secondary tank floor. The UT transducers attached to the end of the probe examine the tank bottom as the probe is slowly retracted from the air slot from an extended position. Water couplant is continuously fed to all transducers at a rate needed to maintain an acceptable signal.

Deployment Tools – A deployment tool was specifically designed to insert and retrieve each scanning system into and out of the DST annular space. The scanner sits on a platform that is manually lowered to the appropriate elevation. The platform has cables attached that can be controlled to move the scanner platform into contact with the examination surface or to the secondary tank floor. The scanner is then driven onto the surface or the tank floor. The deployment tool is retracted until the scanner needs to be removed from the annular space.

P-scan – P-scan is the name of the computerized pulse-echo ultrasonic inspection system used by the inspection vendor. The P-scan system is manufactured by Force Institute in Denmark. It acquires data from zero and angle beam transducers mounted on the crawler, allows real-time analysis, and records the data in electronic memory for post inspection analysis. Force Institute has designated "P-scan mode" to represent the angle beam (flaw length) view and "T-scan mode" to represent the zero beam (thickness) view. T-scan mode is used for normal operation and, if crack-like indications are detected, then the P-scan mode is employed.

During normal T-scan and P-scan operations, the waveforms of the reflected sound wave signals for each transducer are displayed in the "A-scan monitoring mode". The displays are continuously monitored (but not saved), and are primarily used to verify that the transducers are functioning properly (e.g., there is proper probe contact, adequate water flowing, and correctly operating transducer cables). When an indication is detected, the area is rescanned using the "A-scan recording mode". The recorded A-scan waveforms are then reviewed off-line, serving as an additional tool in the evaluation of the indication.

T-SAFT – The Pacific Northwest National Laboratory (PNNL) developed a system capable of examining the entire knuckle region. This remotely operated NDE system utilizes an advanced signal processing method known as SAFT to introduce sound waves from above the knuckle region where access is readily achieved, and examine the knuckle region below. SAFT is recognized by national standards (ASME Boiler and Pressure Vessel Code, Section XI), and has been used for inservice inspection of commercial nuclear power plant components (*Real-Time 3-D SAFT-UT System Evaluation and Validation*, Doctor et al. 1996). The sound is divergent in nature and propagates around the knuckle and along the bottom of the waste tank. The SAFT technique provides a detection and location method for cracks in the knuckle region.

PNNL used an advanced nondestructive evaluation method known as Tandem SAFT or T-SAFT, which utilizes two transducers in a pitch-catch mode, and has the ability to size the depth of the detected crack. The T-SAFT process is a technology development mandated by WDOE Administrative Order 00NWPKW-1251, Item 1b, which has now been incorporated into the

M-48-11 Milestone (HFFACO 2003). The T-SAFT technique has undergone extensive trials internally at PNNL as well as the Network for Evaluating Structural Components[1] and the Program for the Inspection of Steel Components Phase III trials[2], and has successfully passed the Electric Power Research Institute (EPRI) Planar Flaw Sizing Demonstration on April 7, 1989 at the EPRI NDE center. Because of its ability to size defects using the strongly forward scattered signal without the requirement to detect the extremely weak tip diffracted signal, the T-SAFT technique was a very attractive solution to the inspection of the knuckle region of Hanford's double-shell waste tanks. The T-SAFT application used on the Hanford Site tanks was validated through a performance demonstration test (PDT) that met the intent of ASME Section XI Appendix VIII.

Overview Camera – This camera was deployed to observe the area immediately around the inspection area and to aid crawler deployment in the annulus.

Side-view Camera – This camera and light system were installed in a riser adjacent to the inspection riser to provide an overall view of the inspection process.

Riser Enclosure – A modular structure that is placed over the inspection riser. This structure is used to combat adverse weather conditions and supplies an internal hoist for deployment of equipment.

Data Acquisition Control Center – A pull-type trailer was used to house the crawler controls, video monitors, and data collection and evaluation hardware. The trailer was located inside the AZ Tank Farm boundary fence.

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[1] Network for Evaluating Structural Components, managed by the European Union Joint Research Centre "Institute for Energy" in Petten, the Netherlands.

[2] Program for the Inspection of Steel Components Phase III, a major international program involving 15 countries and some 50 NDT teams from a hundred different institutions around the world, sponsored jointly with the Commission of the European Communities and the International Atomic Energy Agency.

4.0 UT INSPECTION DESCRIPTION

The following is the description of the data collection methodology:

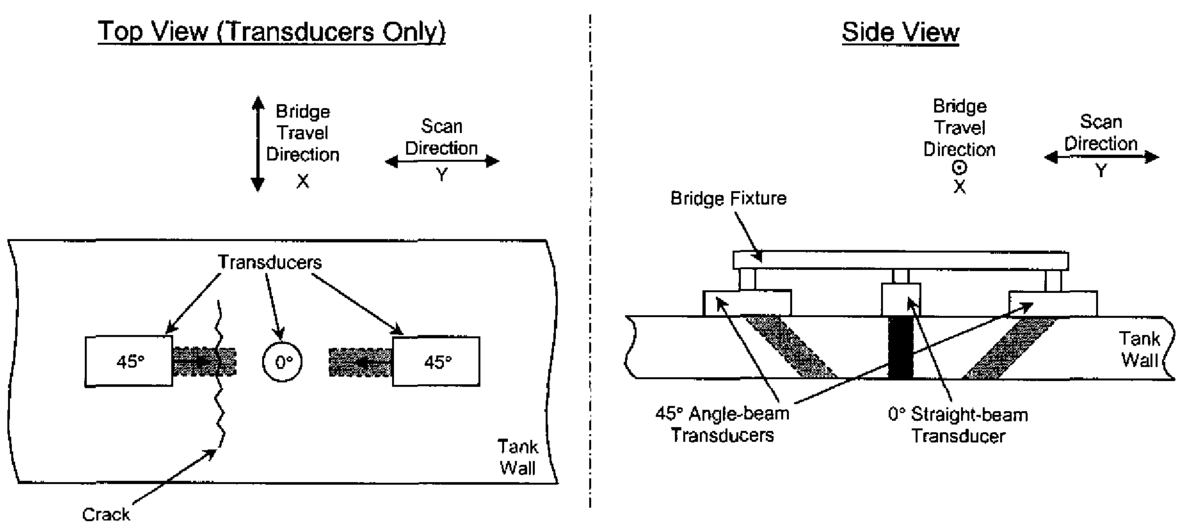
Tank inspection was performed under Job Control System (JCS) work package number 2E-01-1717. All work steps, guidelines, procedures, personnel responsibilities, and protocol for the inspection (Jensen 2002b) were included in the subject work package. Two COGEMA Engineering procedures establish the methods, equipment and requirements for the UT measurements and flaw detection. The P-scan imaging system procedure is *Automated Ultrasonic Examination For Corrosion And Cracking*, COGEMA-SVUT-INS-007.3 (Attachment 1), and the T-SAFT system procedure is *Ultrasonic Examination Of The Knuckle Region*, COGEMA-SVUT-INS-007.5 (Attachment 2).

Three remote crawler systems were utilized for the various DST 241-AZ-102 inspections:

P-scan Crawler for Tank Walls and Knuckle - A remotely controlled, steerable crawler was used to deliver the P-scan UT transducers to the tank wall (Figure 3-1). The crawler was deployed through the 24 inch diameter annulus inspection Riser Number 090 to perform the vertical wall scans, the horizontal wall scans, and the vertical and horizontal weld scans.

The P-scan crawler inspects the primary tank wall using one dual-element 0° transducer to detect wall thinning and corrosion pitting, and two 45° shear-wave transducers to detect cracking transverse to the scanning direction. This examination setup is illustrated in the Figure 4-1 schematic.

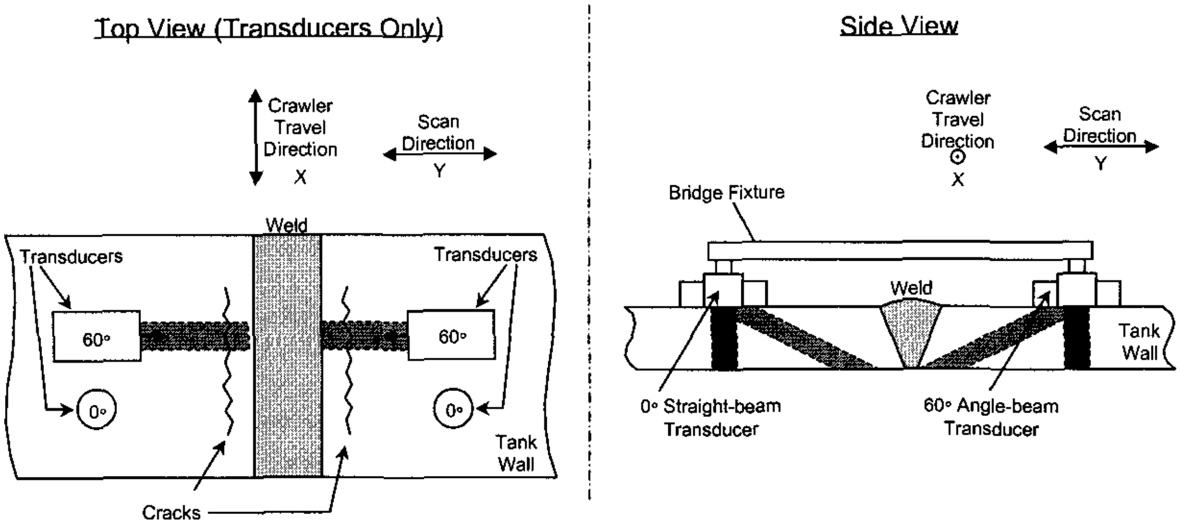
Figure 4-1. Schematic of UT Setup for Vertical Wall Inspection



Vertical Wall Inspection Setup – Uses two 45° Transducers and one 0° Transducer (Inspect for Wall Thinning, Pitting and Axial Cracks)

To detect cracks parallel to the weld, a 60° shear-wave transducer was directed toward the weld and a dual-element 0° transducer is also included to detect wall thinning and corrosion pitting (Figure 4-2).

Figure 4-2. Schematic of UT Setup for First Pass of Weld Inspections



First Pass of Vertical and Horizontal Weld Inspection – Uses two 60° Transducers and two 0° Transducers (Inspect for Wall Thinning, Pitting and HAZ Cracks Parallel to the Weld)

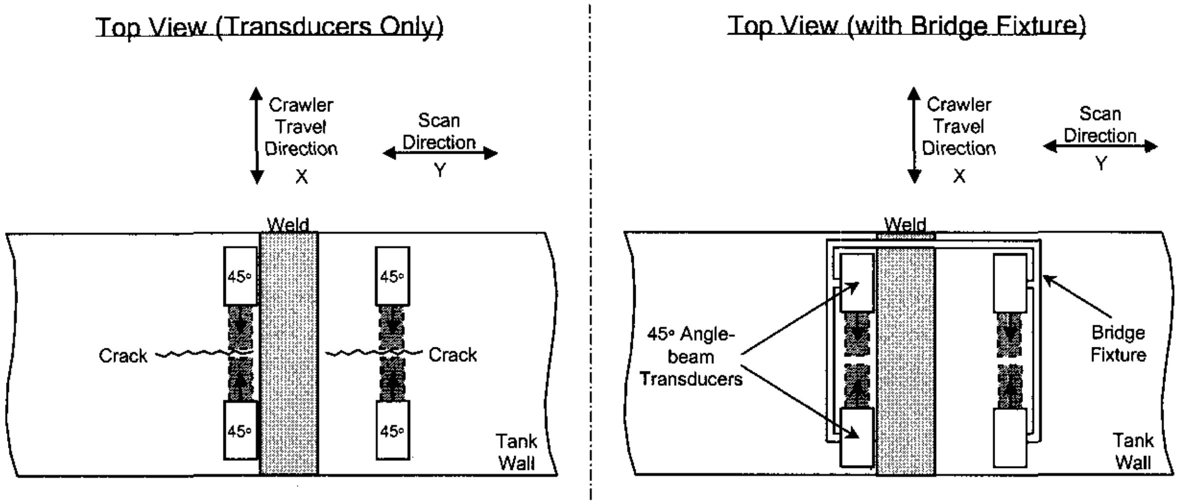
To detect cracks oriented perpendicular to welds, two opposing 45° shear-wave transducers were directed parallel to the weld. Welds were examined from both sides of the weld crown (Figure 4-3). Note that weld and weld examination refer to the UT examination of the heat-affected zone (HAZ).

A special extension arm was attached to the crawler to inspect the primary tank knuckle region. Two 45° shear-wave transducers were attached to the end of the arm to detect cracking transverse to the scanning direction (Figure 4-4). To detect wall thinning and corrosion pitting in the knuckle region, one dual-element 0° transducer was attached to the arm (Figure 4-5).

The setup in Figure 4-5 is used to examine extended, continuous lengths of the primary lower knuckle (typically 20 feet), but interference between the transducer and the insulating concrete pad below the knuckle restricts the examination region to the upper 11 to 12 inches of the knuckle. To inspect lower portions of the knuckle (within a few inches of the tank bottom plate weld), the P-scan transducer can be lined up with air slots in the insulating concrete, permitting approximately 1 inch wide scans in the selected slots (Figure 4-6).

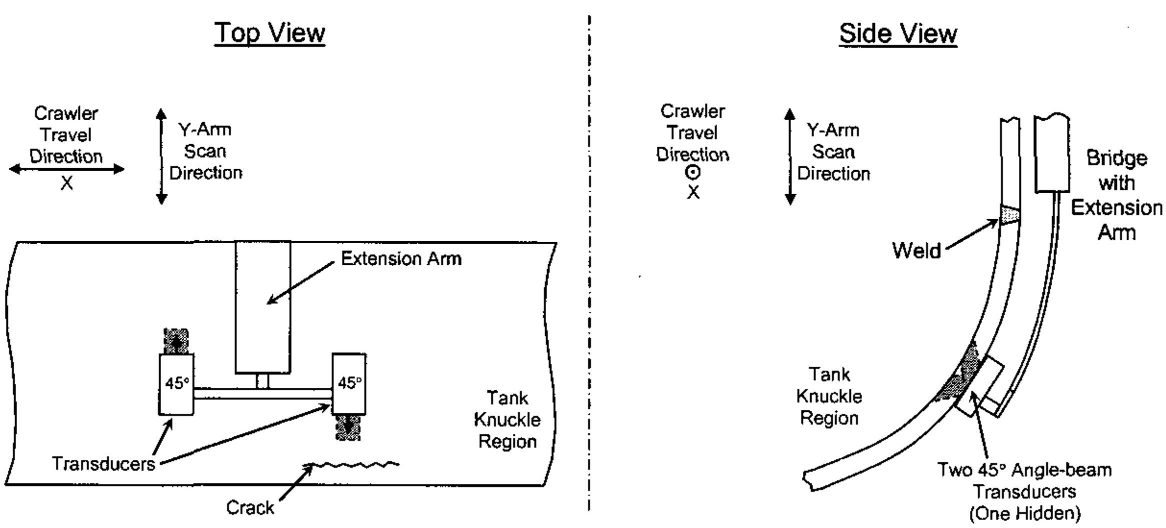
Data and images from the P-scan system were returned to a nearby control center located inside the tank farm fence. The control center contained the crawler controls, video monitors, and data collection and evaluation software and hardware. The UT inspector continuously monitored the signals for reportable indications. The entire inspection was viewed by a camera and lighting system deployed through an adjacent riser.

Figure 4-3. Schematic of UT Setup for Second Pass of Weld Inspections



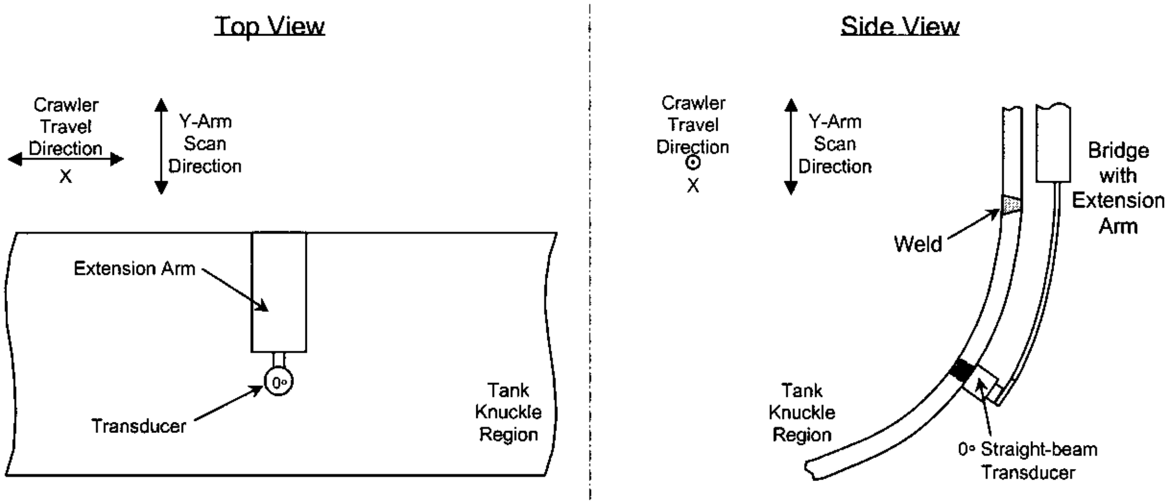
Second Pass of Vertical and Horizontal Weld Inspection – Uses four 45° Transducers (Inspect for Heat-Affected Zone Cracks Perpendicular to the Weld)

Figure 4-4. Schematic of UT Setup for Inspection of Cracks at Knuckle



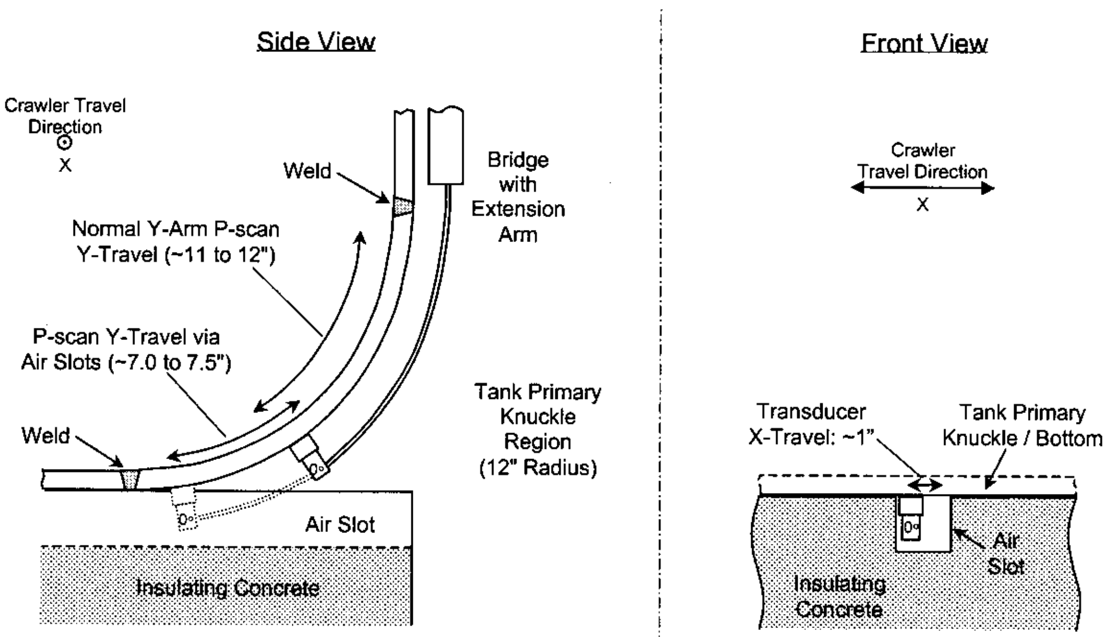
First Pass of Knuckle Inspection Setup – Uses two 45° Transducers (Inspect for Horizontal Knuckle Cracks)

Figure 4-5. Schematic of UT Setup for Inspection of Wall Thinning at Knuckle



Second Pass of Knuckle Inspection Setup – Uses one 0° Transducer (Inspect for Wall Thinning)

Figure 4-6. Schematic of UT Setup for Inspection of Wall Thinning at Knuckle via Air Slots



Setup for P-scan Primary Knuckle Inspection via Air Slots – Uses one 0° Transducer (Inspect for Wall Thinning & Pitting)

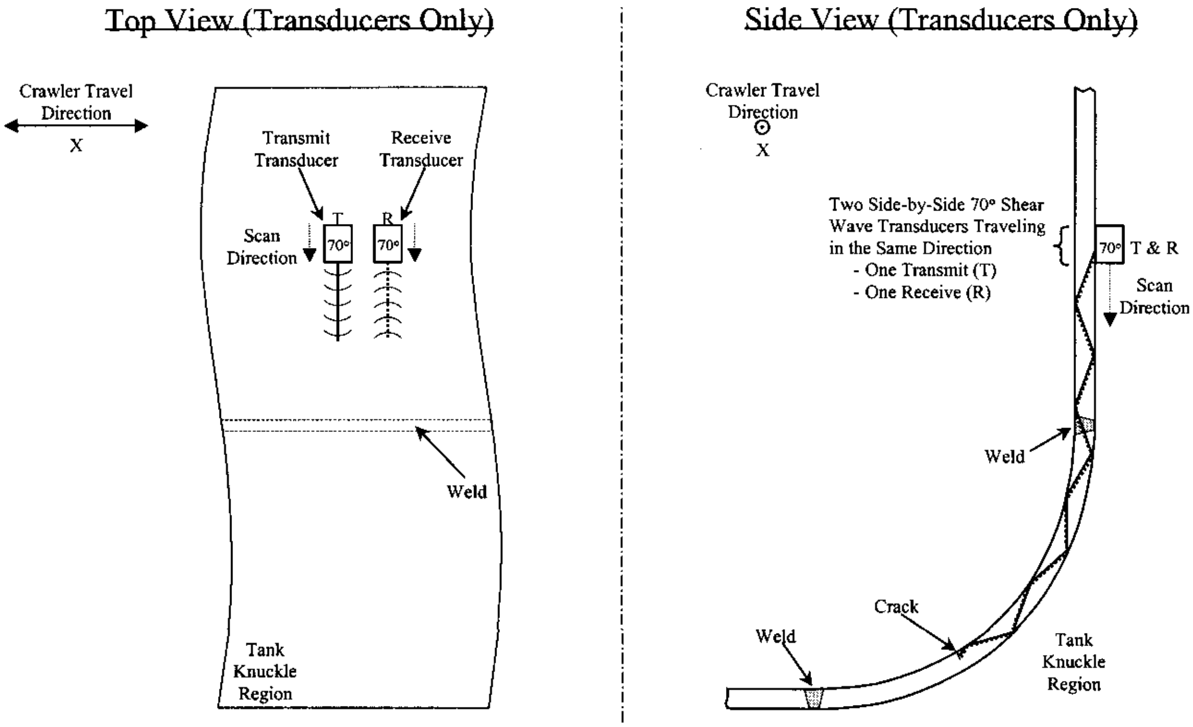
T-SAFT Crawler for Lower Knuckle - A remotely controlled, steerable crawler was also used to deliver the T-SAFT transducers to the tank wall (Figure 3-2). The crawler was deployed through the same 24 inch diameter annulus inspection Riser Number 090 to perform knuckle wall scans.

The T-SAFT crawler system inspects the primary tank lower knuckle wall using two 70° shear wave transducers in a "pitch-catch" mode. The T-SAFT system has the ability to detect and size (length and depth) circumferentially oriented cracks in the knuckle regions that are located beyond the reach of the P-scan crawler system. However, T-SAFT is not currently capable of identifying pitting or measuring wall thickness.

The two transducers are initially positioned side-by-side and are scanned in the same direction. This SAFT technique provides the method for detecting and locating cracks in the knuckle region. The examination setup is illustrated in Figure 4-7. If cracks are detected, then an advanced evaluation method, T-SAFT, utilizes the two transducers to size the detected crack. The transmit transducer initially starts in front of the receive transducer. Both transducers are scanned equal distances but in opposite directions. This examination setup is illustrated in Figure 4-8.

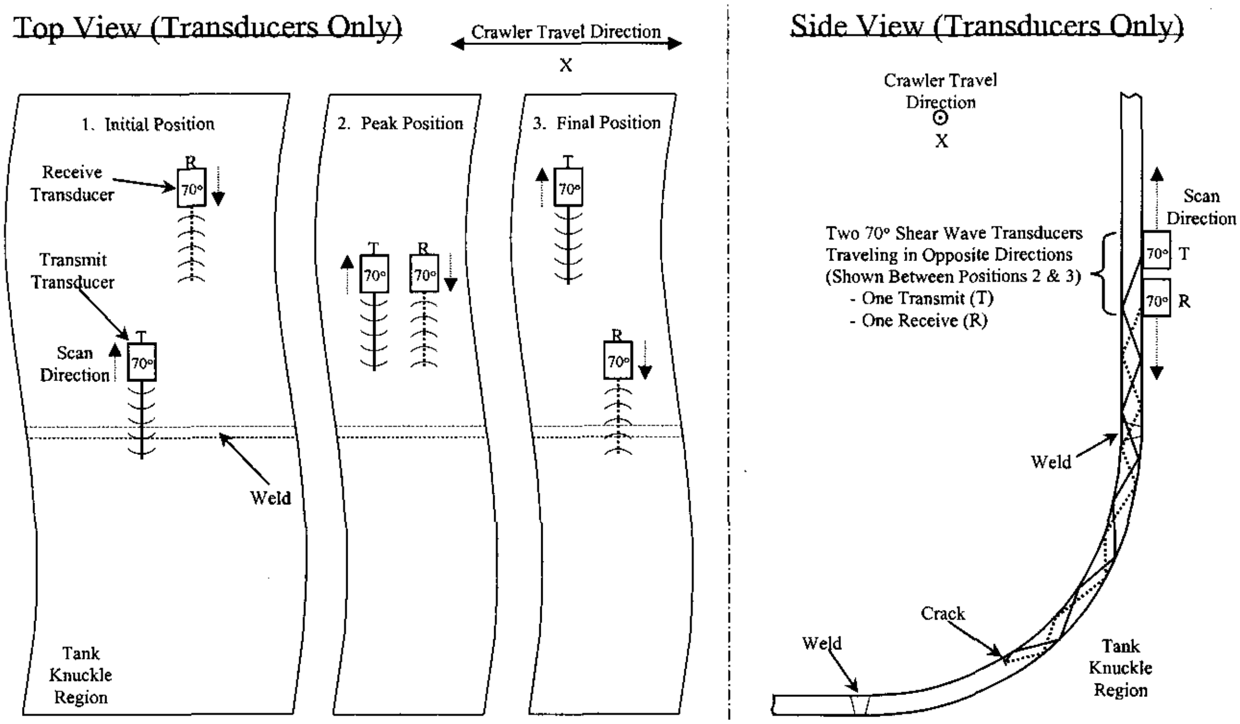
Some of the electronics to support the T-SAFT system were located near the inspection riser. These include the electronics for driving the scanning bridge mechanisms and electronics for the ultrasonic pulser/receiver for inspection of the tank knuckle. Data and images from the T-SAFT system were returned to the control center located inside the tank farm fence. The control center contained the electronics for driving the crawler, the video monitors, and data acquisition and analysis software and hardware. The inspector continuously monitored the signals for reportable indications. This inspection was also viewed by a camera and lighting system deployed through an adjacent riser.

Figure 4-7. Schematic of SAFT Setup for Detecting Cracks at Knuckle



SAFT Knuckle Inspection Setup – Uses two 70° Transducers
(For Detecting Circumferential Cracks)

Figure 4-8. Schematic of T-SAFT Setup for Sizing Cracks at Knuckle

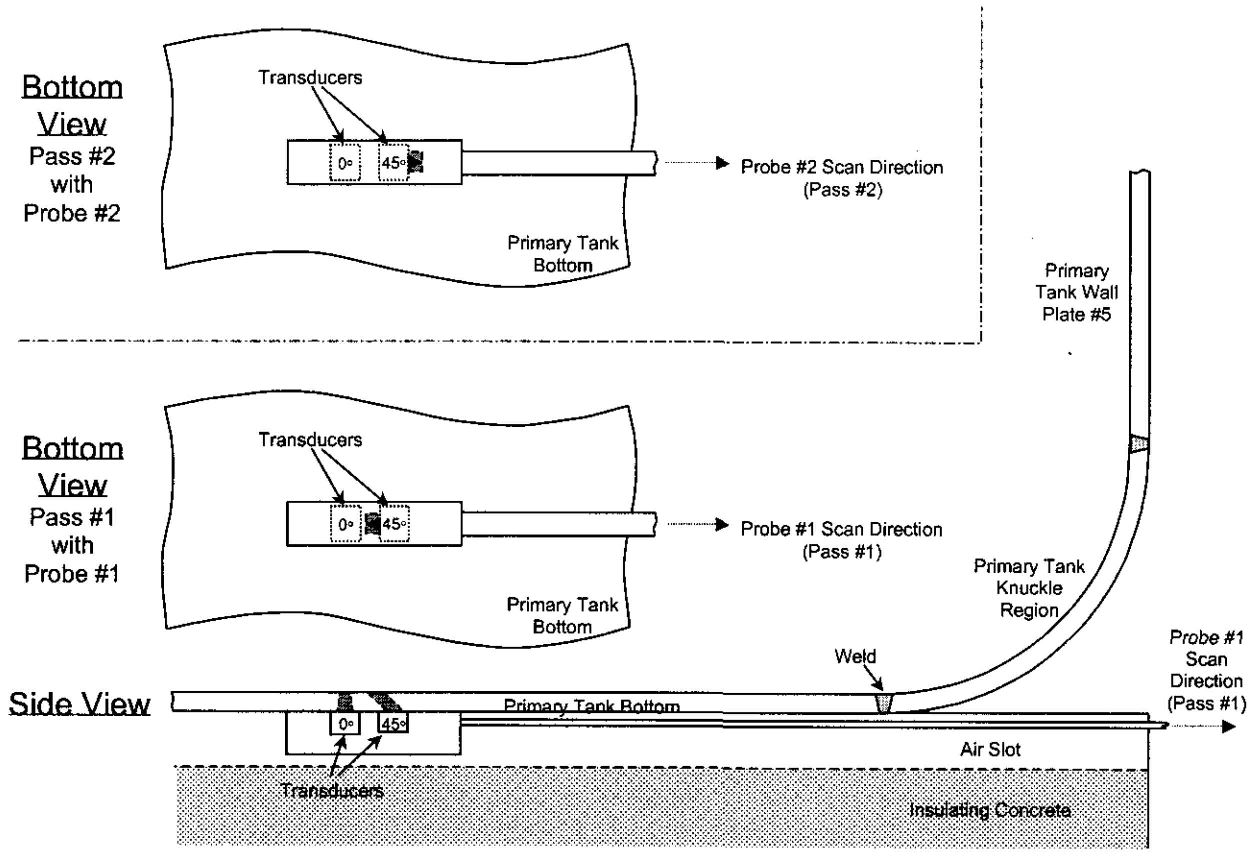


T-SAFT Knuckle Inspection Setup – Uses two 70° Transducers
(For Sizing Circumferential Cracks Detected by SAFT)

RUTI Dual-Crawler System for Primary Tank Bottom – The RUTI system was used to deliver the P-scan UT probe and its transducers to the tank bottom along the air slots (Figure 3-3). RUTI was deployed through the same 24 inch diameter annulus inspection Riser Number 090 to perform tank bottom inspections.

The RUTI system is first outfitted with a UT probe housing two ultrasonic transducers, one 0° focused straight-beam transducer to detect wall thinning and corrosion pitting, and one 45° shear-wave transducer to detect cracking transverse to the scanning direction. The pass along the air slot is then repeated using a second probe with a set of the same type of transducers, but with the 45° shear-wave transducer directed in the opposite direction (see Figure 4-9 for a schematic of the setup).

Figure 4-9. Schematic of RUTI Setup for Tank Bottom Inspection



Tank Bottom Inspection Setup (Two Passes Using Two Probes) –
Uses one 0° Transducer and one 45° Transducer on Each of Two Probes;
The 45° Transducer is Reversed 180° on the Second Probe for the Second Pass.
(Inspect for Wall Thinning, Pitting and Transverse Cracks)

As with the tank wall / tank welds P-scan crawler, data and images from RUTI were returned to a nearby control center located inside the tank farm fence. The control center contained the crawler controls, video monitors, and data collection and evaluation software and hardware. The UT inspector continuously monitored the signals for reportable indications.

5.0 INDICATION REPORTING CRITERIA

COGEMA Engineering was required to report to the customer the following anomalies:

- Wall thinning that exceeded 10 percent of the nominal wall thickness
- Pit depths that exceeded 25 percent of the nominal wall thickness
- Cracks that exceeded 0.1 inch in depth

The reporting criteria is established to identify indications that should be tracked. This tracking is to be used to determine if there is any active mechanism causing additional thinning, pit growth, or crack growth, based on subsequent examinations on the eight to ten year examination interval. The values are nominally 50% of the "acceptance criteria" established in *Acceptance Criteria for Non-Destructive Examination of Double-Shell Tanks* (Jensen 1995) and recommended in *Guidelines for Development of Structural Integrity Programs for DOE High-Level Waste Storage Tanks* (Bandyopadhyay et al. 1997).

For indications exceeding the "acceptance criteria", actions are initiated to evaluate the operability of the DST (Jensen 2002) through the occurrence reporting process. Indications exceeding the "reporting criteria" are reported to the CH2M HILL Project Engineer to be documented in the inspection report (Jensen 2002).

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6.0 PERFORMANCE DEMONSTRATION TESTS

Prior to field use, COGEMA Engineering personnel satisfactorily completed PDTs. The tests were conducted to qualify personnel, test procedures, and ensure the equipment's ability to detect and size wall thinning, pits, and cracks in a series of test plates with artificial defects. The performance demonstration tests were performed on a tank mock-up in the 306E Facility located in the Hanford Site 300 Area. This mock-up also demonstrated the successful deployment and retrieval of the equipment.

The PNNL report, "*Report on Performance Demonstration Test – PDT, May 2000*" (Attachment 3 of *Ultrasonic Inspection Results of Double-Shell Tank 241-AP-108*, Jensen 2000b) provides the details of the complete evaluation of the P-scan system PDT. The PNNL report, "*SAFT/T-SAFT Performance Demonstration Test (PDT), November 14, 2002*" (Attachment 3 of *Ultrasonic Inspection Results of Double-Shell Tank 241-AW-102*, Jensen 2003) provides the details on the qualification of COGEMA Engineering's Level III certified inspector on the T-SAFT system.

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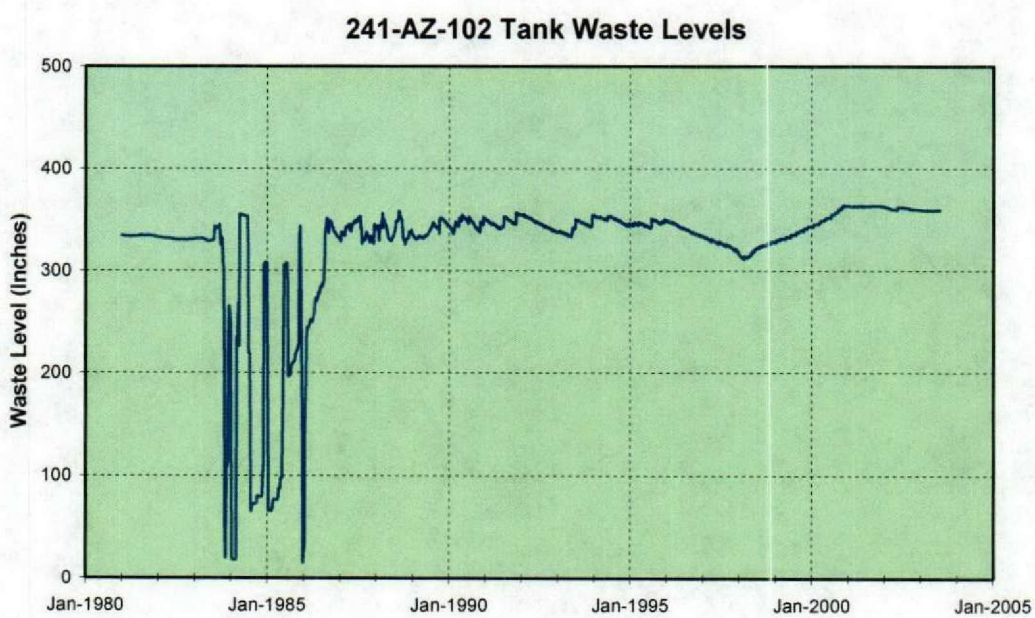
7.0 TANK 241-AZ-102 HISTORY

The 241-AZ Tank Farm consists of two DSTs located in the 200 East Area of the Hanford Site. These underground tanks were built from 1971 through 1977, and are 75 feet in diameter with an operating capacity of 1.00 million gallons.

Tank 241-AZ-102 entered service in 1975. The primary additions to the tank were B Plant low-level waste, aging waste supernatant, PUREX low-level waste, dilute non-complexed waste, unknown waste, and waste water (*Historical Tank Content Estimate for the Southeast Quadrant of the Hanford 200 Areas*, Brevick et al., 1997). Other than a caustic addition in May 2002 and a number of condensate transfers, there have been no major transfers into or out of this tank after the final transfer of aging waste from PUREX in 1993 (*Tank 241-AZ-102 Core Sampling and Analysis Plan, Fiscal Year 2002*, Rasmussen 2002). It is currently classified as an Aging Waste Facility. The tank currently contains approximately 987,000 gallons of waste equivalent to approximately 359 inches: 882,000 gallons of supernatant (321 inches), and 105,000 gallons of sludge (38 inches) (*Waste Tank Summary Report for Month Ending May 31, 2003*, Hanlon 2003).

The waste level history since January 1981 is shown in Figure 7-1, based on data obtained from the Tank Waste Information Network System (TWINS)[3].

Figure 7-1. Waste Level History of Double-Shell Tank 241-AZ-102.



[3] TWINS, http://twins.pnl.gov/twins.htm, queried 07/22/2003 [Data Source: Measurements, SACS, Surface Level, Tank Name AZ-102, All Measurement Date values]

Since August 1986, the minimum recorded waste level was approximately 311 inches (February 22, 1998). The maximum recorded waste level was approximately 364 inches, occurring from November 17 to December 6, 2000. The average waste level since August 1986 has been 345 inches. Since October 2000, the level has also been relatively constant, averaging 361.5 inches.

Since January 1995, recorded temperatures of the tank have ranged from a maximum of 189°F (October and November 1997) to a minimum of 94.3°F (July 2003), and have averaged 127°F. This is based on data obtained from the TWINS[4].

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[4] TWINS, http://twins.pnl.gov/twins.htm, queried 07/22/2003 [Data Source: Measurements, SACS, Tank Temperature Readings, Tank Name AZ-102, All Measurement Date values]. Used only "Good" Quality Indicator data. Also, ignored Riser-014 values (20.8 – 40.8 °F) from July 2001.

8.0 GENERAL REQUIREMENTS AND INSPECTION SCOPE

FY 2003 Contract Number 16449 specifies that the contractor provide (among others) the following deliverables to the Double-Shell Tank Integrity Project (DSTIP) organization:

- The contractor shall provide AZ-102 NDE Support and Data Analysis
- The contractor shall prepare recommended engineering reports and studies as directed by the DSTIP project leads

The areas on the primary tank that were identified for UT inspection in the engineering task plan (Jensen 2002b) are described below.

Primary Tank Wall and Welds:

- A vertical strip (approximately 30 inches wide by 35 feet long) of the primary wall between the upper haunch transition and the lower knuckle. The vertical strip may be comprised of one or more strips whose total width is 30 inches.
- Twenty feet of the circumferential weld joining the cylinder to the lower knuckle. One vertical weld joining the lowest shell course plates (about 10 feet of weld), and one vertical weld joining the next to the lowest shell course plates (about 10 feet of weld). A minimum of twenty (20) feet of vertical weld shall be examined.

Primary Tank Knuckle:

- A strip in the primary lower knuckle to detect the presence of cracks orientated in the circumferential direction, and for pits and wall thinning. The area to be examined is 20 feet long in the circumferential direction and, in the meridional direction, is from the weld joining the transition plate with the knuckle to the furthest reach of the transducer assembly that is allowed by the tank geometric constraints (using the flexible arm attachment to the existing P-scan system, supplemented by T-SAFT, if available). The 20-foot dimension is not required to be a continuous length.

Primary Tank Bottom:

- Strips on the primary tank bottom along the insulating concrete air slots to detect the presence of pits, wall thinning and cracks orientated perpendicular to the air slot channels. In each accessible channel, the tank directly above the channels is to be examined over the width of the channel and for a distance of 12 feet towards the tank center beginning seven inches inboard of the outside radius of the tank.

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9.0 EQUIPMENT SETUP AT AZ TANK FARM

Prior to performing the actual inspection, the riser (number 090, 24 inch) shield plug was removed, and a temporary cover and riser extension were secured to the riser. A portable enclosure was installed over the riser to provide the means for deploying the UT equipment and protecting the operators from the weather. An electric chain hoist, mounted to the roof frame, was used for maneuvering the equipment into position. The control center trailer was set up inside the AZ Tank Farm's boundary fence, and the control cables were run along the ground to the equipment located at the riser. A typical tank farm setup is shown in Figure 9-1. Some of the electronics to support the T-SAFT system were also located near the inspection riser.

Figure 9-1. Typical Field Set-Up at Riser for Double-Shell Tank

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10.0 INSPECTION RESULTS

Tank 241-AZ-102 was fabricated from carbon steel plate. The primary tank's exterior surface varies from mill scale to coatings of various degrees of rust caused by in-service corrosion of carbon steel. A description of the plates is as follows with the location of the plates as shown in Figure 10-1 (*Tanks 101 & 102 Section & Details 241-AZ Tank Farm,* Vitro Hanford 1973).

Primary knuckle (top) – Connects dome of tank to side-wall

Primary wall – Consists of (from top to bottom)
Plate #1 – approximately 3 feet 3 inch tall, 3/8 inch nominal thickness
Plate #2 – approximately 9 feet 10 inch tall, 1/2 inch nominal thickness
Plate #3 – approximately 9 feet 10 inch tall, 1/2 inch nominal thickness
Plate #4 – approximately 9 feet tall, 3/4 inch nominal thickness
Plate #5 – approximately 2 feet tall, 7/8 inch nominal thickness

Primary knuckle (bottom) – Approximately 7/8 inch nominal thickness. Connects sidewall of tank to primary tank bottom.

The P-scan crawler was deployed through the 24 inch diameter annulus inspection Riser 090 near the north side of tank 241-AZ-102 for examinations of the primary wall, the lower knuckle, and vertical and horizontal welds. All tank welds examined were in the "as-welded" condition. The T-SAFT crawler was also deployed through the 24 inch diameter annulus inspection Riser 090 for examination of the lower knuckle. The various scan paths for the crawlers are shown in Figure 10-1, along with other pertinent tank information.

Additional P-scan measurements of the lower knuckle were made using the P-scan crawler equipped with the extension arm lined up with air slots in the insulating concrete. The locations of these scan paths are shown in the Figure 10-2 schematic. Also, P-scan measurements of the tank bottom were planned using the RUTI system, which is equipped with the UT probe lined up with air slots in the insulating concrete. However, problems with crumbling concrete in the air slots prevented this task from being performed at this time (discussed in Section 11.0). The locations of the air slots that were visually examined prior to abandoning this task are identified in Figure 10-2.

The UT P-scan data and the T-SAFT data were examined by COGEMA Engineering's Level III certified inspector. The P-scan data were also examined by Limited Level II certified inspectors. The Limited Level II inspectors were "P-scan Limited", indicating that they are qualified to collect and examine the P-scan data, but are not qualified to interpret the data.

Figure 10-1. Schematic of UT Scan Paths on North Side of Tank 241-AZ-102 Wall (via Riser 090)

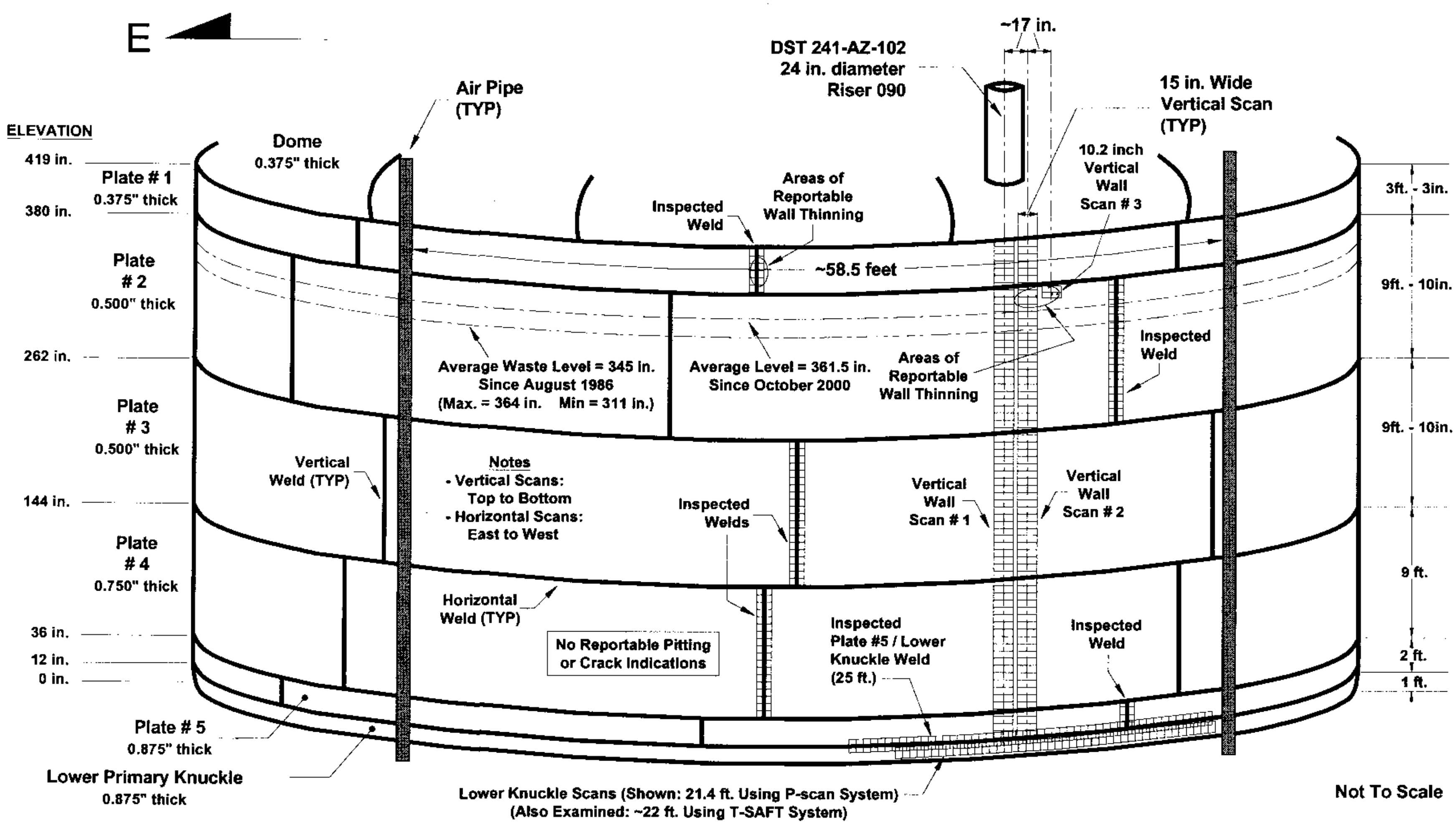
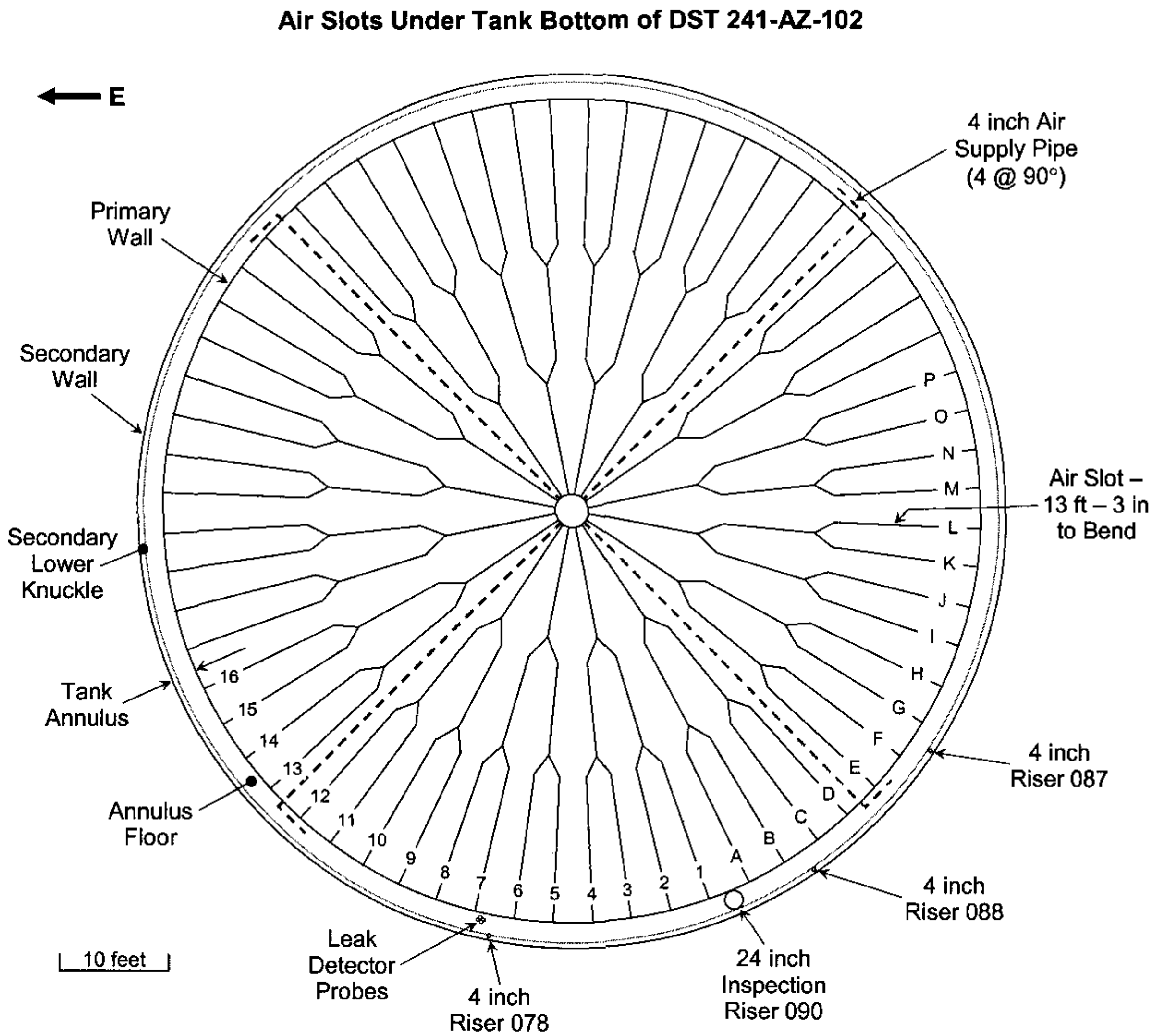


Figure 10-2. Top View Schematic of Tank 241-AZ-102 Bottom Showing the Air Slots



Inspection Method	Air Slot Number	Data Sheet File Name
P-scan Y-Arm Inspection of Lower Knuckle via Air Slots	1	Y-Arm / SLOT 1-1
	4	Y-Arm / SLOT 2-1
	A	Y-Arm / SLOT A1
	B	Y-Arm / SLOT B1
P-scan RUTI Inspection of Primary Tank Bottom via Air Slots	1 through 6 and A through L	- N/A - (Air Slots Examined with Camera, but Measurements Abandoned)

Ref: H-2-67244

The following pages contain tables that present summary and detailed wall thickness data, which were derived from the COGEMA "Automated Ultrasonic Thickness Data Report Sheets". The inspection data sheets, the transducer calibration sheets, the original tank wall and weld scan map, and an interpretation of the data by an independent Level III certified NDE Inspector are included in Attachment 3 for the P-scan data.

Also included in the following pages are tables that present summary and detailed scan data derived from the "SAFT/T-SAFT Ultrasonic Data Report Sheets". The inspection data sheet, the transducer calibration sheet and the original tank knuckle scan map are included in Attachment 4 for T-SAFT data.

Tables 10-1 through 10-6 show the measured minimum wall thickness values obtained using the P-scan system, and are displayed in a summarized form by wall plates (including the lower knuckle), vertical plate welds, and horizontal knuckle weld. Although the data are reported to three significant figures, the accuracy of the wall thickness data, based on the results of the performance demonstration test, is 0.012 inch root-mean-square (RMS).

Table 10-7 summarizes the results of the probe of the knuckle region for cracks using the T-SAFT system.

Table 10-1. Summary of Primary Tank Wall Scan 1 (via Riser 090)

Plate Description	Elevation of Wall Scan (inches)	Wall Scan Distance (inches) (1)	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Plate #1	417 to 382.3	34.7	0.375	0.338	90.1%
Plate #2	379 to 264.8	114.2	0.500	0.456	91.2%
Plate #3	261 to 147.0	114.0	0.500	0.487	97.4%
Plate #4	143 to 37.1	105.9	0.750	0.752	100.3%
Plate #5	35 to 14.0	21.0	0.875	0.878	100.3%

(1) All scan widths were 15 inches.

Table 10-2. Summary of Primary Tank Wall Scan 2 (via Riser 090)

Plate Description	Elevation of Wall Scan (inches)	Wall Scan Distance (inches) [1]	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Plate #1	417 to 382.3	34.7	0.375	0.350	93.3%
Plate #2	379 to 264.8	114.2	0.500	0.416 [2]	83.2%
				0.418 [2]	83.6%
				0.412 [2]	82.4%
Plate #3	261 to 147.0	114.0	0.500	0.504	100.8%
Plate #4	143 to 37.7	105.3	0.750	0.756	100.8%
Plate #5	35 to 12.5	22.5	0.875	0.874	99.9%

(1) All scan widths were 15 inches.

(2) Wall thinning exceeds 10 percent of the nominal plate thickness.

Table 10-3. Summary of Primary Tank Wall Scan 3 (via Riser 090)

Plate Description	Elevation of Wall Scan (inches)	Wall Scan Distance (inches) [1]	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Plate #2	379 to 368.8	10.2	0.500	0.411 [2]	82.2%
				0.414 [2]	82.8%
				0.434 [2]	86.8%

(1) All scan widths were 15 inches.

(2) Wall thinning exceeds 10 percent of the nominal plate thickness.

Table 10-4. Summary of Primary Tank Lower Knuckle Scan Using the P-scan System (via Riser 090)

Plate Description	Vertical Location of Knuckle Scan	Knuckle Scan Distance (inches)	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Upper Portion of Lower Knuckle	From 2 inches to 13.5 – 14.9 inches below Plate #5 / Knuckle Weld	Horizontal Distance: 256.4 [(1)]	0.875	0.840	96.0%
Lower Portion of Lower Knuckle (in 4 Air Slots)	From approx. 10 – 12 inches to approx. 16 – 18 inches below Plate #5 / Knuckle Weld	Total Vertical Distance in 4 Air Slots: 29.0 [(2)]	0.875	0.858	98.1%

[(1)] Scan widths were 11.5 – 12.9 inches.

[(2)] Horizontal x-travels of scans in slots were 0.57 – 0.79 inches.

Table 10-5. Summary of Primary Tank Weld Scans (via Riser 090)

Weld Description	Elevation of Weld Scan (inches)	Weld Scan Distance (inches) [(1)]	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Vertical Weld Plate #1	416 to 385.2	30.8	0.375	0.334 [(2)]	89.1%
				0.312 [(2)]	83.2%
				0.333 [(2)]	88.8%
Vertical Weld Plate #2	379 to 263.3	115.7	0.500	0.473	94.6%
Vertical Weld Plate #3	261 to 147.6	113.4	0.500	0.474	94.8%
Vertical Weld Plate #4	143 to 40	103	0.750	0.739	98.5%
Vertical Weld Plate #5	35 to 13.6	21.4	0.875	0.850	97.1%

[(1)] Scan widths were 10.4 – 10.9 inches.

[(2)] Wall thinning exceeds 10 percent of the nominal plate thickness.

Table 10-6. Summary of Plate #5 / Knuckle Horizontal Weld Scans (via Riser 090)

Weld Description	Vertical Location of Weld Scan	Weld Scan Distance (inches) (1)	Design Nominal (inches)	Measured Minimum (inches)	Scan Minimum % of Nominal
Horizontal Weld Plate #5 to Knuckle, Plate-side	From ~1 in. to ~5.1 in. above Plate #5 / Knuckle Weld	300.1	0.875	0.842	96.2%
Horizontal Weld Plate #5 to Knuckle, Knuckle-side	From ~1 in. to ~5.1 in. below Plate #5 / Knuckle Weld	300.1	0.875	0.837	95.7%

(1) Scan widths were 10.1 to 10.3 inches.

Table 10-7. Summary of Primary Tank Lower Knuckle Scan Using the T-SAFT System (via Riser 090)

Plate Description	T-SAFT File Numbers	Vertical Location of Horizontal Knuckle Scan	Knuckle Horizontal Scan Distance (inches) (1)	Comments
Lower Knuckle	102AZ 1 thru 19 0812; 102AZ 1A thru 1H 0813	SAFT / T-SAFT transducers located above the Plate #5 / Knuckle Weld, but entire Lower Knuckle (from weld to weld) probed for cracks	~270	No cracks detected using the SAFT mode

(1) Each T-SAFT file represents a horizontal scan of 12.5 inches, but the crawler is moved only 10 inches after each scan to ensure overlap. Therefore, the total knuckle scan distance for the 27 files would be a few inches above 270 inches.

Tables 10-8 through 10-18 contain the detailed data for wall scans as presented in 12 inch long by 15 inch wide connecting scans. Table 10-19 contains the detailed P-scan data for the lower knuckle scans as presented in 12 inch long by 11.5 to 12.9 inch wide connecting scans. Table 10-20 contains the detailed P-scan data for lower knuckle scans in individual air slots as presented in 5.3 to 8.3 inch long by 0.59 to 0.79 inch wide scans. Table 10-21 contains information on the T-SAFT data scans. The detailed data for vertical and horizontal welds are presented in 12 inch long by 10.1 to 10.9 inch wide scans in Tables 10-22 through 10-28.

Table 10-8. Primary Tank Vertical Wall Scan 1 - Plate 1 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / Plate 1" (Page Att. 3-3)	417	0 – 12	0.375	0.389	0.374
	405	12 – 24	0.375	0.388	0.338
	393	24 – 34.7	0.375	0.388	0.345

(1) Scan start was 2 inch below the centerline of the first horizontal weld, and centerline of 24 inch Riser 090; Scan width was 15 inches.

Table 10-9. Primary Tank Vertical Wall Scan 1 - Plate 2 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / Plate 2" (Page Att. 3-4)	379	0 – 12	0.500	0.490	0.456
	367	12 – 24	0.500	0.490	0.485
	355	24 – 36	0.500	0.496	0.483
	343	36 – 48	0.500	0.500	0.493
	331	48 – 60	0.500	0.502	0.492
	319	60 – 72	0.500	0.503	0.482
	307	72 – 84	0.500	0.503	0.498
	295	84 – 96	0.500	0.502	0.498
	283	96 – 108	0.500	0.503	0.497
	271	108 – 114.2	0.500	0.504	0.499

(1) Scan start was 1 inch below the centerline of the second horizontal weld, and centerline of 24 inch Riser 090; Scan width was 15 inches.

Table 10-10. Primary Tank Vertical Wall Scan 1 - Plate 3 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) [1]	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / Plate 3" (Page Att. 3-5)	261	0 – 12	0.500	0.499	0.487
	249	12 – 24	0.500	0.500	0.494
	237	24 – 36	0.500	0.500	0.497
	225	36 – 48	0.500	0.503	0.499
	213	48 – 60	0.500	0.505	0.499
	201	60 – 72	0.500	0.507	0.501
	189	72 – 84	0.500	0.508	0.499
	177	84 – 96	0.500	0.507	0.501
	165	96 – 108	0.500	0.505	0.499
	153	108 – 114	0.500	0.508	0.499

[1] Scan start was 1 inch below the centerline of the third horizontal weld, and centerline of 24 inch Riser 090; Scan width was 15 inches.

Table 10-11. Primary Tank Vertical Wall Scan 1 - Plate 4 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) [1]	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / Plate 4" (Page Att. 3-6)	143	0 – 12	0.750	0.775	0.759
	131	12 – 24	0.750	0.770	0.763
	119	24 – 36	0.750	0.770	0.763
	107	36 – 48	0.750	0.770	0.762
	95	48 – 60	0.750	0.775	0.763
	83	60 – 72	0.750	0.775	0.763
	71	72 – 84	0.750	0.772	0.761
	59	84 – 96	0.750	0.770	0.758
	47	96 – 105.9	0.750	0.770	0.752

[1] Scan start was 1 inch below the centerline of the fourth horizontal weld, and centerline of 24 inch Riser 090; Scan width was 15 inches.

Table 10-12. Primary Tank Vertical Wall Scan 1 - Plate 5 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / Plate 5" (Page Att. 3-7)	35	0 – 12	0.875	0.905	0.880
	23	12 – 21	0.875	0.905	0.878

(1) Scan start was 1 inch below the centerline of the fifth horizontal weld, and centerline of 24 inch Riser 090; Scan width was 15 inches.

Table 10-13. Primary Tank Vertical Wall Scan 2 - Plate 1 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / 2nd / Plate 1" (Page Att. 3-13)	417	0 – 12	0.375	0.388	0.369
	405	12 – 24	0.375	0.391	0.371
	393	24 – 34.7	0.375	0.391	0.350

(1) Scan start was 2 inch below the centerline of the first horizontal weld, and 17 inches west of Scan 1, centerline to centerline; Scan width was 15 inches.

Table 10-14. Primary Tank Vertical Wall Scan 2 - Plate 2 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / 2nd / Plate 2" (Page Att. 3-14)	379	0 – 12 (2)	0.500	0.495	0.416 (5)
	379	0 – 12 (3)	0.500	0.495	0.418 (5)
	367	12 – 24 (4)	0.500	0.500	0.412 (5)
	355	24 – 36	0.500	0.505	0.489
	343	36 – 48	0.500	0.505	0.498
	331	48 – 60	0.500	0.505	0.495
	319	60 – 72	0.500	0.505	0.492
	307	72 – 84	0.500	0.510	0.498
	295	84 – 96	0.500	0.507	0.497
	283	96 – 108	0.500	0.503	0.490
	271	108 – 114.2	0.500	0.510	0.497

(1) Scan start was 1 inch below the centerline of the second horizontal weld; Scan 2 was 17 inches west of Scan 1, centerline to centerline; Scan width was 15 inches.

(2) Thinning: X-Start = 5.91" X-Stop = 7.14" Y-Start = 7.3" Y-Stop = 7.7" Area: 1.23" x 0.4" = 0.49 sq. in.

(3) Thinning: X-Start = 5.25" X-Stop = 7.30" Y-Start = -6.3" Y-Stop = -7.3" Area: 2.05" x 1.0" = 2.05 sq. in.

(4) Thinning: X-Start = 15.06" X-Stop = 15.79 Y-Start = 6.4" Y-Stop = 7.2" Area: 0.73" x 0.8" = 0.58 sq. in.

(5) Wall thinning exceeds 10 percent of the nominal plate thickness.

Table 10-15. Primary Tank Vertical Wall Scan 2 - Plate 3 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / 2nd / Plate 3" (Page Att. 3-15)	261	0 – 12	0.500	0.510	0.504
	249	12 – 24	0.500	0.511	0.506
	237	24 – 36	0.500	0.515	0.507
	225	36 – 48	0.500	0.514	0.508
	213	48 – 60	0.500	0.517	0.511
	201	60 – 72	0.500	0.518	0.511
	189	72 – 84	0.500	0.518	0.511
	177	84 – 96	0.500	0.516	0.511
	165	96 – 108	0.500	0.514	0.508
	153	108 – 114	0.500	0.517	0.509

(1) Scan start was 1 inch below the centerline of the third horizontal weld, and 17 inches west of Scan 1, centerline to centerline; Scan width was 15 inches.

Table 10-16. Primary Tank Vertical Wall Scan 2 - Plate 4 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / 2nd / Plate 4" (Page Att. 3-16)	143	0 – 12	0.750	0.775	0.763
	131	12 – 24	0.750	0.770	0.764
	119	24 – 36	0.750	0.770	0.763
	107	36 – 48	0.750	0.772	0.763
	95	48 – 60	0.750	0.773	0.759
	83	60 – 72	0.750	0.771	0.756
	71	72 – 84	0.750	0.770	0.763
	59	84 – 96	0.750	0.770	0.759
	47	96 – 105.3	0.750	0.775	0.759

(1) Scan start was 1 inch below the centerline of the fourth horizontal weld, and 17 inches west of Scan 1, centerline to centerline; Scan width was 15 inches.

Table 10-17. Primary Tank Vertical Wall Scan 2 - Plate 5 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / 2nd / Plate 5" (Page Att. 3-17)	35	0 – 12	0.875	0.910	0.885
	23	12 – 22.5	0.875	0.905	0.874

(1) Scan start was 1 inch below the centerline of the fifth horizontal weld, and 17 inches west of Scan 1, centerline to centerline; Scan width was 15 inches.

Table 10-18. Primary Tank Vertical Wall Scan 3 - Plate 2 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Wall Scan (inches)	Vertical Location of Wall Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Wall / 3rd / Plate 2" (Page Att. 3-23)	379	0 – 10.2 (2)	0.500	0.495	0.411 (5)
	379	0 – 10.2 (3)	0.500	0.495	0.414 (5)
	379	0 – 10.2 (4)	0.500	0.495	0.434 (5)

(1) Scan start was 1 inch below the centerline of the second horizontal weld; Scan 3 was approximately 17 inches west of Scan 2, centerline to centerline; Scan width was 15 inches.

(2) Thinning: X-Start = 0.394" X-Stop = 1.64" Y-Start = 0.887" Y-Stop = 2.02" Area: 1.25" x 1.13" = 1.41 sq. in.

(3) Thinning: X -Start = 5.56" X-Stop = 8.14" Y-Start = 0.169" Y-Stop = -0.972" Area: 2.58" x 1.14" = 2.94 sq. in.

(4) Thinning: X -Start = 6.24" X-Stop = 6.95 Y-Start = -4.14" Y-Stop = -5.02" Area: 0.71" x 0.88" = 0.62 sq. in.

(5) Wall thinning exceeds 10 percent of the nominal plate thickness.

Table 10-19. Primary Tank Lower Knuckle Scan Using the P-scan System (via Riser 090)

Scan I.D. Number (Data Sheets)	**Vertical Location of Horizontal Knuckle Scan**	**Horizontal Location of Knuckle Scan (inches)**	**Design Nominal (inches)**	**Measured Average (inches)**	**Measured Minimum (inches)**
Scan "Y-Arm / Knuckle" (Page Att. 3-25)	From 2 in. to 14 in. below Plate #5 / Knuckle Weld	0 – 12 (1)	0.875	0.870	0.843
		12 – 24	0.875	0.875	0.842
		24 – 36	0.875	0.882	0.854
		36 – 48	0.875	0.885	0.854
		48 – 60	0.875	0.885	0.852
		60 – 68.4	0.875	0.890	0.848
Scan "Y-Arm / Knuckle / A" (Page Att. 3-26)	From 2 in. to 14.9 in. below Plate #5 / Knuckle Weld	0 – 12 (2)	0.875	0.895	0.868
		12 – 24	0.875	0.895	0.865
		24 – 36	0.875	0.895	0.865
		36 – 48	0.875	0.895	0.853
		48 – 60	0.875	0.890	0.858
		60 – 68	0.875	0.890	0.856
Scan "Y-Arm / Knuckle / B" (Page Att. 3-27)	From 2 in. to 13.5 in. below Plate #5 / Knuckle Weld	0 – 12 (3)	0.875	0.880	0.843
		12 – 24	0.875	0.875	0.840
		24 – 36	0.875	0.880	0.849
		36 – 48	0.875	0.880	0.850
		48 – 60	0.875	0.880	0.852
		60 – 72	0.875	0.880	0.846
		72 – 84	0.875	0.890	0.842
		84 – 96	0.875	0.890	0.856
		96 – 108	0.875	0.890	0.866
		108 – 120	0.875	0.885	0.856

(1) Start of scan @ 2nd knuckle vertical weld east of 24 inch riser; Scan width was 12 inches.

(2) Start of scan @ 1st knuckle vertical weld east of 24 inch riser; Scan width was 12.9 inches.

(3) Start of scan @ end of previous scan; Scan width was 11.5 inches.

Table 10-20. Primary Tank Lower Knuckle Scan Using the P-scan System in Air Slots (via Riser 090)

Scan I.D. Number (Data Sheets)	Vertical Location of Knuckle Scan in Slot	Vertical Y-Travel of Knuckle Scan in Slot (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Y-Arm / Slot 1-1" (Page Att. 3-32)	Exact starting positions not determined, but approximately 10 to 12 inches below the Plate #5 / Knuckle Weld; Scans overlap areas examined in continuous scans (see Table 10-19)	8.3 (1)	0.875	0.890	0.864
Scan "Y-Arm / Slot 2-1" (Page Att. 3-33)		5.3 (2)	0.875	0.880	0.858
Scan "Y-Arm / Slot A1" (Page Att. 3-34)		7.6 (3)	0.875	0.898	0.858
Scan "Y-Arm / Slot B2" (Page Att. 3-35)		7.8 (4)	0.875	0.885	0.866

(1) Horizontal x-travel of scan in slot was 0.79 inches.
(2) Horizontal x-travel of scan in slot was 0.77 inches.
(3) Horizontal x-travel of scan in slot was 0.57 inches.
(4) Horizontal x-travel of scan in slot was 0.59 inches.

Table 10-21. Primary Tank Lower Knuckle Scan Using the T-SAFT System (via Riser 090)

T-SAFT File Number (Data Sheets)	Vertical Location of Horizontal Knuckle Scan	Horizontal Distance of T-SAFT Knuckle Scan (inches) (1)	Comments
Files 102AZ 1 thru 19 0812 (Page Att. 4-3)	SAFT / T-SAFT transducers located above the Plate #5 / Knuckle Weld, but entire Lower Knuckle (from weld to weld) probed for cracks	0 to ~190 (2)	No cracks detected using the SAFT mode
Files 102AZ 1A thru 1H 0813 (Page Att. 4-3)		0 to ~80 (3)	No cracks detected using the SAFT mode

(1) Each T-SAFT file represents a horizontal scan of 12.5 inches, but the crawler is moved only 10 inches after each scan to ensure overlap.
(2) Start of scan @ 1st knuckle vertical weld east of 24 inch riser.
(3) Start of scan @ 2nd knuckle vertical weld east of 24 inch riser.

Table 10-22. Primary Tank Vertical Wall Weld Scan - Plate 1 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Weld Scan (inches)	Vertical Location of Weld Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Weld / Plate 1" (Page Att. 3-36)	416	0 – 12 (2)	0.375	0.380	0.334 (5)
	404	12 – 24 (3)	0.375	0.380	0.312 (5)
	392	24 – 30.8 (4)	0.375	0.380	0.333 (5)

(1) Scan start was 3 inches below the centerline of the first horizontal weld; Scan width was 10.6 inches.

(2) Thinning: X-Start = 9.33" X-Stop = 9.38" Y-Start = -4.01" Y-Stop = -4.08" Area: 0.05" x 0.07" = 0.0035 sq. in.

(3) Thinning: X-Start = 14.20" X-Stop = 14.58" Y-Start = -5.20" Y-Stop = -5.89" Area: 0.38" x 0.69" = 0.26 sq. in.

(4) Thinning: X-Start = 26.65" X-Stop = 26.70 Y-Start = 0.976" Y-Stop = 1.08" Area: 0.05" x 0.10" = 0.005 sq. in.

(5) Wall thinning exceeds 10 percent of the nominal plate thickness.

Table 10-23. Primary Tank Vertical Wall Weld Scan - Plate 2 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Weld Scan (inches)	Vertical Location of Weld Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Weld / Plate 2" (Page Att. 3-37)	379	0 – 12	0.500	0.495	0.479
	367	12 – 24	0.500	0.495	0.481
	355	24 – 36	0.500	0.500	0.473
	343	36 – 48	0.500	0.500	0.487
	331	48 – 60	0.500	0.500	0.476
	319	60 – 72	0.500	0.500	0.488
	307	72 – 84	0.500	0.505	0.484
	295	84 – 96	0.500	0.505	0.496
	283	96 – 108	0.500	0.505	0.489
	271	108 – 115.7	0.500	0.505	0.499

(1) Scan start was 1 inch below the centerline of the second horizontal weld; Scan width was 10.4 inches.

Table 10-24. Primary Tank Vertical Wall Weld Scan - Plate 3 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Weld Scan (inches)	Vertical Location of Weld Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Weld / Plate 3" (Page Att. 3-38)	261	0 – 12	0.500	0.500	0.482
	249	12 – 24	0.500	0.500	0.474
	237	24 – 36	0.500	0.500	0.482
	225	36 – 48	0.500	0.505	0.479
	213	48 – 60	0.500	0.505	0.479
	201	60 – 72	0.500	0.505	0.478
	189	72 – 84	0.500	0.505	0.487
	177	84 – 96	0.500	0.505	0.497
	165	96 – 108	0.500	0.505	0.489
	153	108 – 113.4	0.500	0.505	0.496

(1) Scan start was 1 inch below the centerline of the third horizontal weld; Scan width was 10.9 inches.

Table 10-25. Primary Tank Vertical Wall Weld Scan - Plate 4 (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Start of Weld Scan (inches)	Vertical Location of Weld Scan (inches) (1)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Vert. Weld / Plate 4" (Page Att. 3-39)	143	0 – 12	0.750	0.760	0.740
	131	12 – 24	0.750	0.760	0.748
	119	24 – 36	0.750	0.760	0.752
	107	36 – 48	0.750	0.760	0.748
	95	48 – 60	0.750	0.760	0.749
	83	60 – 72	0.750	0.758	0.749
	71	72 – 84	0.750	0.759	0.752
	59	84 – 96	0.750	0.758	0.739
	47	96 – 103	0.750	0.760	0.744

(1) Scan start was 1 inch below the centerline of the fourth horizontal weld; Scan width was 10.5 inches.

Table 10-26. Primary Tank Vertical Wall Weld Scan - Plate 5 (via Riser 090)

Scan I.D. Number (Data Sheets)	**Elevation of Start of Weld Scan (inches)**	**Vertical Location of Weld Scan (inches)** [(1)]	**Design Nominal (inches)**	**Measured Average (inches)**	**Measured Minimum (inches)**
Scan "Vert. Weld / Plate 5" (Page Att. 3-40)	35	0 – 12	0.875	0.905	0.891
	23	12 – 21.4	0.875	0.905	0.850

(1) Scan start was 1 inch below the centerline of the fifth horizontal weld; Scan width was 10.6 inches.

Table 10-27. Primary Tank Horizontal Weld - Plate 5 to Knuckle Scan, Plate Side (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Horizontal Weld Scan (inches)	Horizontal Location of Weld Scan, Plate Side (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Horz. Weld / Knuckle" (Page Att. 3-51)	From ~1 in. to ~5.1 in. above Plate #5 / Knuckle Weld	0 – 12 (1)	0.875	0.909	0.889
		12 – 24	0.875	0.910	0.888
		24 – 36	0.875	0.910	0.885
		36 – 48	0.875	0.910	0.887
		48 – 60	0.875	0.915	0.881
		60 – 72	0.875	0.915	0.891
		72 – 84	0.875	0.920	0.864
		84 – 96	0.875	0.907	0.860
		96 – 106.4	0.875	0.905	0.886
Scan "Horz. Weld / Knuckle A" (Page Att. 3-53)	From ~1 in. to ~5.1 in. above Plate #5 / Knuckle Weld	0 – 12 (2)	0.875	0.895	0.877
		12 – 24	0.875	0.895	0.842
		24 – 36	0.875	0.885	0.865
		36 – 48	0.875	0.885	0.863
		48 – 60	0.875	0.885	0.849
		60 – 72	0.875	0.885	0.852
		72 – 84	0.875	0.885	0.852
		84 – 96	0.875	0.885	0.868
		96 – 108	0.875	0.885	0.863
		108 – 120	0.875	0.885	0.862
Scan "Horz. Weld / Knuckle B" (Page Att. 3-55)	From ~1 in. to ~5.1 in. above Plate #5 / Knuckle Weld	0 – 12 (3)	0.875	0.890	0.870
		12 – 24	0.875	0.895	0.870
		24 – 36	0.875	0.895	0.871
		36 – 48	0.875	0.890	0.868
		48 – 60	0.875	0.890	0.866
		60 – 73.7	0.875	0.895	0.871

(1) Start of scan @ 2nd knuckle vertical weld east of 24 inch riser; Scan width was 10.3 inches.
(2) Start of scan @ 1st knuckle vertical weld east of 24 inch riser; Scan width was 10.1 inches.
(3) Start of scan @ 1st knuckle vertical weld west of 24 inch riser; Scan width was 10.2 inches.

Table 10-28. Primary Tank Horizontal Weld - Plate 5 to Knuckle Scan, Knuckle Side (via Riser 090)

Scan I.D. Number (Data Sheets)	Elevation of Horizontal Weld Scan (inches)	Horizontal Location of Weld Scan, Plate Side (inches)	Design Nominal (inches)	Measured Average (inches)	Measured Minimum (inches)
Scan "Horz. Weld / Knuckle" (Page Att. 3-52)	From ~1 in. to ~5.1 in. below Plate #5 / Knuckle Weld	0 – 12 (1)	0.875	0.875	0.854
		12 – 24	0.875	0.875	0.856
		24 – 36	0.875	0.875	0.851
		36 – 48	0.875	0.882	0.862
		48 – 60	0.875	0.890	0.870
		60 – 72	0.875	0.890	0.856
		72 – 84	0.875	0.890	0.865
		84 – 96	0.875	0.890	0.864
		96 – 106.4	0.875	0.885	0.867
Scan "Horz. Weld / Knuckle A" (Page Att. 3-54)	From ~1 in. to ~5.1 in. below Plate #5 / Knuckle Weld	0 – 12 (2)	0.875	0.895	0.872
		12 – 24	0.875	0.890	0.870
		24 – 36	0.875	0.892	0.871
		36 – 48	0.875	0.890	0.869
		48 – 60	0.875	0.885	0.864
		60 – 72	0.875	0.885	0.856
		72 – 84	0.875	0.865	0.837
		84 – 96	0.875	0.865	0.843
		96 – 108	0.875	0.870	0.849
		108 – 120	0.875	0.870	0.842
Scan "Horz. Weld / Knuckle B" (Page Att. 3-55)	From ~1 in. to ~5.1 in. below Plate #5 / Knuckle Weld	0 – 12 (3)	0.875	0.875	0.851
		12 – 24	0.875	0.880	0.851
		24 – 36	0.875	0.880	0.872
		36 – 48	0.875	0.890	0.871
		48 – 60	0.875	0.885	0.855
		60 – 73.7	0.875	0.885	0.858

(1) Start of scan @ 2nd knuckle vertical weld east of 24 inch riser; Scan width was 10.3 inches.
(2) Start of scan @ 1st knuckle vertical weld east of 24 inch riser; Scan width was 10.1 inches.
(3) Start of scan @ 1st knuckle vertical weld west of 24 inch riser; Scan width was 10.2 inches.

11.0 EVALUATION OF INSPECTION RESULTS

The results from the inspection of tank 241-AZ-102 are evaluated and compared with results of all other tank ultrasonic inspections.

11.1 TANK 241-AZ-102 UT DATA EVALUATION

The UT P-scan data and T-SAFT data were interpreted by W. H. Nelson, COGEMA Engineering's Level III certified inspector. The P-scan data were also examined by J. B. Elder, an independent Level III certified NDE Inspector. Mr. Elder independently evaluated the P-scan raw data and concurred with COGEMA Engineering's interpretation (Attachment 3). The P-scan and T-SAFT data have also been evaluated by PNNL as a third party review. Their results and conclusions were found to be consistent with those described in this report. Their P-scan and T-SAFT data review is *Ultrasonic Examination Of Double-Shell Tank 241-AZ-102 - Examination Completed August 2003*, PNNL report number PNNL-14373, Rev. 0 (Attachment 5).

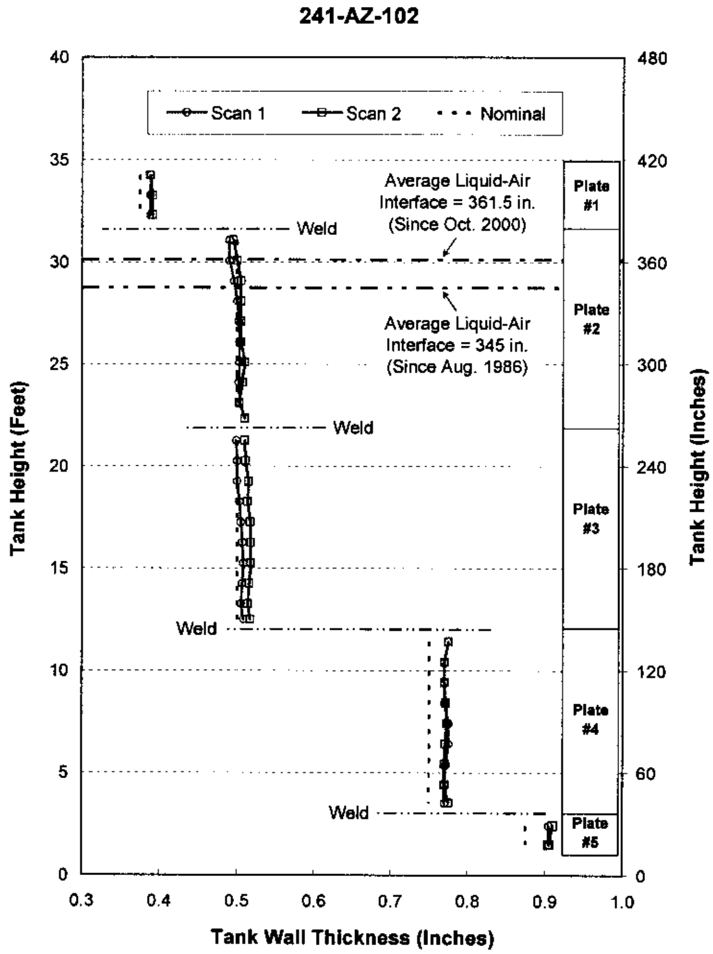
The results of the tank 241-AZ-102 UT inspections (both P-scan and T-SAFT) indicated no pit-like indications and no cracking in any of the areas examined. However, there were six areas of reportable wall thinning detected during the primary tank vertical wall scans of Plate #2, and three areas of reportable wall thinning detected during the primary tank vertical weld scan of Plate #1. These are discussed in more detail below.

Figure 11-1 illustrates all of the "as-found" average wall thickness measurements of the primary tank vertical wall scans generated from the P-scan Inspection Data Sheets (Attachment 3). Each measurement plotted on Figure 11-1 is the average of all data collected over a 12 inch long by 15 inch wide scan area. Areas of interest for tank 241-AZ-102 are the vapor space above the current liquid waste, the current liquid-vapor interface (approximately 30.0 feet or 360 inches), the liquid region, the liquid-solids interface (3.17 feet or 38 inches), and the solids region. The six instances of reportable wall thinning that occurred in Plate #2 were located in the vicinity of the liquid-vapor interface.

The UT data show that the primary tank average wall thickness values exceeded the nominal values specified in the design documents. The UT data, when compared to construction specifications, drawings, standards, and codes (*241-AZ Double-Shell Tanks Integrity Assessment Report*, Jensen 1999), reveal that the as-found condition of the tank plates and welds are within the allowable design limits. A summary of the results associated with the areas examined is presented below.

Primary Tank Wall: Two vertical strips encompassing Plates #1 through #5 were examined. The overall average wall thickness for each plate vertical scan varied only 0.008 inches from plate to plate (for same nominal-thickness plates) and a maximum of 0.011 inches within the same plate (for all plates). All overall plate wall averages were between 0.002 inches and 0.022 inches greater than their nominal plate thickness values. No reportable pitting indications or crack-like indications were found.

Figure 11-1. Scan Data Average Wall Thickness Compared to Nominal Plate Thickness



However, areas of reportable wall thinning were detected during the second primary tank vertical wall scan of Plate #2. The wall thinning was confined to three areas in the upper portion of the plate, approximately 6 to 17 inches below the Plate #1 / Plate #2 horizontal weld, equivalent to tank elevations of approximately 374 to 363 inches (Figure 10-1). This discovery prompted a third, short (10.2 inches long) inspection scan adjacent to the second scan on Plate #2 to determine the extent of thinning. Three more areas of wall thinning were detected approximately 1 to 9 inches below the Plate #1 / Plate #2 horizontal weld, equivalent to tank elevations of approximately 379 to 371 inches. The six areas ranged from 0.4 to 1.14 inches in width, from 0.71 to 2.58 inches in length, and from 0.49 to 2.94 square inches in area. A total of 8.1 square inches of thinned area was identified, ranging from 0.066 to 0.089 inches deep (based on nominal wall thickness values of 0.500 inches), or 13.2% to 17.8% wall thickness reduction (Tables 10-2, 10-3, 10-14 and 10-18).

As stated earlier, the average waste level since August 1986 has been 345 inches, with a maximum recorded waste level of approximately 364 inches. Since October 2000, the level has been relatively constant, averaging 361.5 inches. The six areas of reportable wall thinning occurred in the vicinity above these liquid-air interface levels.

Lower Primary Knuckle Wall: A horizontal strip (21.4 feet long by approximately 12 inches wide) along the lower primary knuckle wall was examined using the P-scan system. The overall lower knuckle wall thickness average of 0.885 inches exceeded the nominal plate thickness value (0.875 inches) by 0.010 inches. Vertical strips totaling 2.4 feet long by approximately 0.7 inches wide of the lower portion of the lower knuckle were examined using the P-scan transducer lined up with four different air slots. The inspections yielded wall thickness average values that were between 0.005 inches and 0.023 inches greater than the nominal plate thickness values. No reportable wall thinning, pitting indications or crack-like indications were found using the P-scan system.

A horizontal scan (approximately 22 feet long) using the T-SAFT system was performed just above the lower knuckle weld, which probed the entire lower knuckle region below the transducers for circumferential cracks. No reportable crack-like indications were found using the T-SAFT system.

Primary Tank Welds: One vertical weld in each of the five Plates #1 through #5 was examined. The plate walls adjacent to the welds averaged 0.001 to 0.030 inches greater than their nominal plate thickness values. No crack-like indications were found. There were also no reportable pitting indications found.

However, areas of reportable wall thinning were detected during the primary tank vertical weld scan of Plate #1. The wall thinning was confined to three small areas, approximately 12 to 30 inches below the Dome / Plate #1 horizontal weld, equivalent to tank elevations of approximately 407 to 389 inches (Figure 10-1). The three areas ranged from 0.07 to 0.69 inches in width, from 0.05 to 0.38 inches in length, and from 0.0035 to 0.26 square inches in area. A total of 0.27 square inches of thinned area was identified, ranging from 0.041 to 0.063 inches deep (based on nominal wall thickness values of 0.375 inches), or 10.9% to 16.8% wall thickness reduction (Tables 10-5 and 10-22).

Primary Tank Knuckle-to-Shell Weld: A 25 feet long region of the horizontal knuckle-to-shell weld was examined. No crack-like indications were found. There were also no reportable wall thinning or pitting indications found. The plate walls adjacent to the weld averaged 0.023 inches greater than (plate side) to 0.007 inches greater than (knuckle side) their nominal plate thickness values.

Primary Tank Bottom: According to the inspection scope outlined in the engineering task plan (Jensen 2002b), several strips on the primary tank bottom along the insulating concrete air slots were to be inspected to detect the presence of pits, wall thinning and cracks orientated perpendicular to the air slot channels. However, when the RUTI system was used to first view the air slots for condition and obstructions, it was discovered that the insulating concrete within the slots was severely crumbling, and made worse by the motion of the camera probe. Examples of two of the slots with crumbling concrete are shown in Figures 11-2 and 11-3. At one point, the camera that was attached to the end of the flexible cable became lodged within a slot, requiring considerable effort to withdraw it. Air slots were visually inspected on either side of Riser 090 (Figure 10-2), but all of the slots showed some form of degradation. A management decision was made to halt further attempts to scan the tank bottom due to the possibility of the RUTI probe being permanently wedged between spalled concrete inside an air slot. The insulating concrete spalling was documented via Problem Evaluation Report PER-2003-3006 and the resulting DOE Occurrence Report RP-CHG-TANKFARM-2003-0039.

Figure 11-2. Air Slot in DST 241-AZ-102 Showing Crumbling Concrete

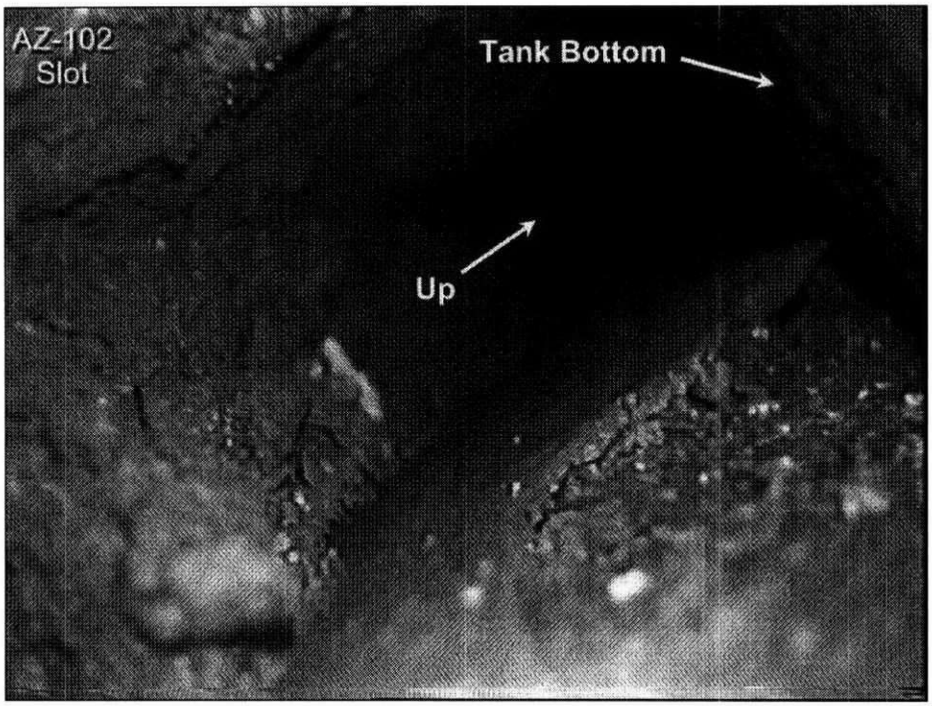
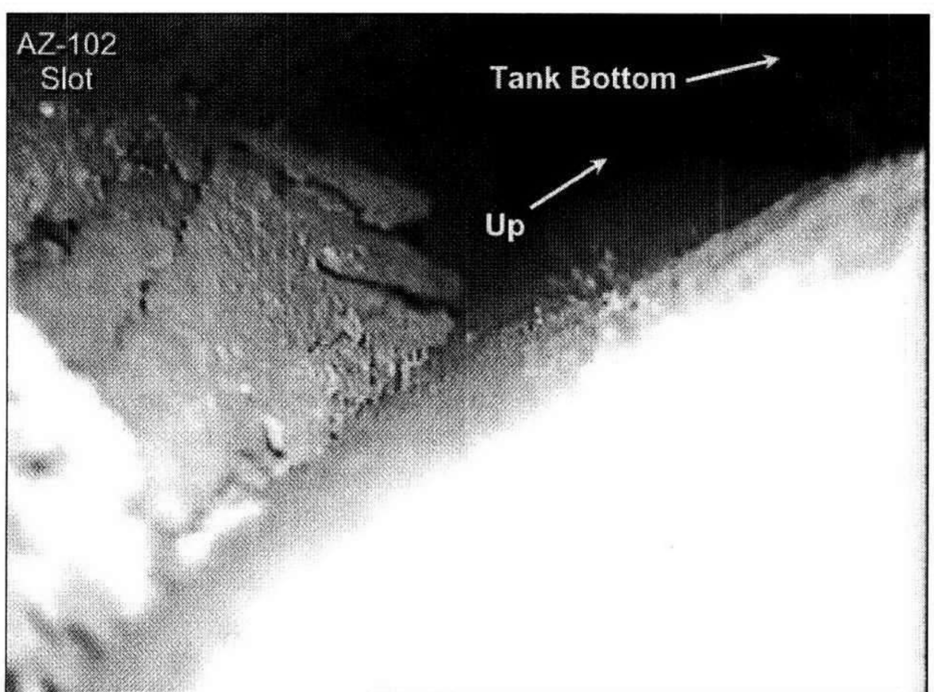


Figure 11-3. Air Slot in DST 241-AZ-102 Showing Concrete Debris Blocking Passage



11.2 DST ULTRASONIC INSPECTION DATA RESULTS COMPARISON

The following Tables 11-1 and 11-2 provide a summary of primary tank vertical wall inspection results and a comparison of primary tank wall thinning.

Table 11-1 reports the inspection results chronologically according to fiscal year (October 1 through September 30).

Table 11-1. Double-Shell Tanks Chronological Inspection Results Findings

Tank	Inspection Year (FY)	Reportable Plate Crack Indication	Reportable Plate Pitting	Reportable Plate Thinning	Reportable Weld Thinning, Pitting or Cracking
AW-103	1997	None	None	None	None
AN-107	1998	None	None	None	None
AN-106	1999	None	None	None	None
AN-105	1999	None	None	Two very minute areas of a plate (20% maximum reduction in thickness) [(a)]	None
AZ-101	1999	None	None	One area of a plate (11.4% maximum reduction in thickness)	None
AY-102	1999	None	None	None	None
AP-107	2000	None	None	None	None
AP-108	2000	None	None	Two minute areas of a plate (13.8% maximum reduction in thickness).	None [(b)]
AW-101	2001	None	None	A pit like indication in a very minute area of a plate (16% maximum reduction in thickness).	None
AW-105	2001	None	None	None	None
AY-101	2001	None	Pit-like indication at historical liquid-air interface	Some pit-like indications identified as thinning	Three areas of 10% wall thinning in vertical welds
AN-102	2001	None	None	One minute area of a plate (11% maximum reduction in thickness)	None
AN-101	2002	None	None	One small area of a plate (12 % maximum reduction in thickness)	Four local areas near vertical welds (14% maximum reduction in thickness)
AW-106	2002	None	None	One small area	10.4% maximum reduction in thickness

(Cont. on next page)

Table 11-1. (Cont.) Double-Shell Tanks Chronological Inspection Results Findings

Tank	Inspection Year (FY)	Reportable Plate Crack Indication	Reportable Plate Pitting	Reportable Plate Thinning	Reportable Weld Thinning, Pitting or Cracking
AY-101	2002	Not Investigated	None	72 areas of >10% wall thinning, most in the historical liquid-air interface in Plate #2 (20.2% maximum reduction in thickness)	Not Investigated
AW-104	2002	None	None	None	None
AW-102	2002 & 2003 [(c)]	None	None	None	None
AN-105	2002	None	None	None	Not Investigated
AP-101	2003	None	None	None	None
AP-105	2003	None	None	None	None
AP-103	2003	None	None	None	None [(d)]
AZ-102	2003	None	None	Six small areas in the vicinity of the liquid-air interface in Plate #2 (13.2% to 17.8% maximum reduction in thickness)	Three small areas of wall thinning near the Plate #1 vertical weld (10.9% to 16.8% maximum reduction in thickness)

[(a)] Based on a review of the tank 241-AN-105 data gathering technique in FY 1999, prompted by the FY 2002 results, the FY 1999 wall thinning data is considered questionable.

[(b)] Although below reporting criteria at the time, one linear crack-like indication 6 inch long by 0.142 inch deep in a nominal 0.750 inch thick plate was observed. Subsequent examination of tank 241-AP-108 in FY 2002 revealed no change in size.

[(c)] Primary knuckle examination using T-SAFT conducted in FY 2003.

[(d)] One linear crack-like indication 2.92 inches long in the weld heat-affected zone of a nominal 0.875 inch thick plate was detected. A follow-up inspection determined that the indication is a small area of incomplete fusion that is not open to either surface of the tank.

The inspection results in Table 11-1 show that the overall condition of the inspected tanks is satisfactory. Defects or minute reportable localized plate thinning may be due to various reasons, such as fabrication defects, construction damage or in-service corrosion.

Wall thickness data gathered from ultrasonic examination of twenty DSTs were compared to evaluate the degree of wall thinning that may have occurred among the tanks examined. These wall thickness data do not allow a direct calculation of wall thinning, since no measurements were made of original plate thicknesses at the time of construction. However, wall thickness data from ultrasonic testing may be compared to the specified nominal plate thickness. This assessment used the minimum wall thickness in each scanning area (generally 12 inch by 15 inch) from the vertical wall scans and then calculated the average for each plate using the minimum thickness values.

Table 11-2 provides a summary of wall thinning, defined as nominal plate thickness minus average minimum plate thickness[5], by nominal plate size, and by DST examined. The negative values in the table indicate where the average of all minimum values of plate thickness exceeds nominal plate thickness. The Table also provides the calculated average wall thinning and associated standard deviation by DST examined for all nominal plate thicknesses, and by nominal plate thickness for all DSTs examined.

Tank 241-AZ-102 did not exhibit any significant thinning, with only the 0.375 inch thick Plate #1 and the 0.500 inch thick Plate #2 minimum values averaging slightly below (0.017 inches and 0.007 inches respectively) the nominal plate thickness values.

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[5] Average minimum plate thickness is defined as the average of all the minimum measured thicknesses for each scanning area (generally 12 inch by 15 inch) for a given plate size and DST.

Table 11-2. Tank Wall Thinning By Nominal Plate Size

DST	FY Examined	Wall Thinning* By Nominal Plate Size (Inches)						
		0.375"	0.500"	0.5625"	0.750"	0.875"	AVG	STD DEV
AN-101	2002	n/a	0.008	n/a	0.027	0.015	0.013	0.014
AN-102	2001	n/a	0.004	n/a	0.003	0.005	0.004	0.016
AN-105	1999	n/a	0.026	n/a	0.007	0.001	0.019	0.032
AN-105	2002	n/a	0.015	n/a	n/exam.	n/exam.	0.015	0.021
AN-106	1999	n/a	0.006	n/a	0.015	0.012	0.009	0.009
AN-107	1998	n/a	-0.018	n/a	-0.015	0.013	-0.016	0.017
AP-101	2003	n/a	-0.008	-0.003	-0.002	0.010	-0.004	0.008
AP-103	2003	n/a	0.008	-0.004	-0.009	0.007	0.000	0.012
AP-105	2003	n/a	0.004	-0.006	-0.002	0.010	0.000	0.009
AP-107	2000	n/a	-0.011	-0.012	-0.017	-0.013	-0.013	0.008
AP-108	2000	n/a	-0.017	-0.012	-0.011	-0.005	-0.014	0.016
AW-101	2001	n/a	0.008	n/a	0.014	0.020	0.010	0.013
AW-102	2002	n/a	-0.019	n/a	-0.006	0.008	-0.014	0.012
AW-103	1997	n/a	-0.010	n/a	-0.005	0.004	-0.007	0.008
AW-104	2002	n/a	-0.036	n/a	-0.031	-0.007	-0.033	0.011
AW-105	2001	n/a	0.000	n/a	0.008	-0.003	0.002	0.018
AW-106	2002	n/a	-0.004	n/a	0.015	0.000	0.001	0.016
AY-101	2001	-0.011	0.030	n/a	0.018	0.012	0.030	0.029
AY-102	1999	-0.021	0.001	n/a	0.008	n/a	0.000	0.012
AZ-101	1999	0.021	0.027	n/a	0.020	0.003	0.024	0.011
AZ-102	2003	0.017	0.007	n/a	-0.011	-0.004	0.002	0.019
AVG:		0.000	0.001	-0.008	0.002	0.004		
STD DEV:		0.021	0.023	0.008	0.019	0.012		

* Thinning = nominal plate size – minimum thickness
n/a – not applicable; n/exam. – not examined

12.0 FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The findings, conclusions, and recommendations from the UT inspection of DST 241-AZ-102 are listed below.

- There were six areas of reportable wall thinning detected during the second and third primary tank vertical wall scans of Plate #2. The wall thinning was confined to areas in the upper portion of the plate at tank elevations of approximately 379 to 363 inches. A total of 8.1 square inches of thinned area was identified, ranging from 0.066 to 0.089 inches deep, or 13.2% to 17.8% wall thickness reduction. The six areas of reportable wall thinning occurred in the vicinity just above the liquid-air interface levels that have existed since August 1986. There was no additional reportable wall thinning detected in any of the other vertical wall plate areas examined.

  The six areas of reportable wall thinning are suspected to be a result of vapor space corrosion. These thinned areas are to be evaluated by a corrosion engineer to determine if an increased frequency of UT examination of these areas is warranted.

- No reportable wall thinning was detected in any of the lower primary knuckle areas examined. The primary knuckle horizontal scan yielded an overall average wall thickness values that exceeded the nominal plate thickness value by 0.010 inches. Inspections of the lower portion of the lower knuckle using the P-scan transducer lined up with air slots yielded wall thickness average values that exceeded the nominal values.

- No reportable pitting indications nor any crack-like indications were detected in any of the vertical wall plates or lower primary knuckle. This includes approximately 20 feet of the primary knuckle in which no circumferential crack-like indications were detected using both the P-scan and the T-SAFT systems. Although the P-scan system is limited to examining the upper two-thirds of the knuckle, the T-SAFT system is capable of probing the entire knuckle region for crack-like indications (from weld to weld, which includes the highest stress region).

- No crack-like indications were detected in any of the weld heat-affected zones. The primary tank vertical weld scans (Plates #1 through #5) and the knuckle-to-shell horizontal weld scan (Plate #5 to lower knuckle) yielded overall average wall thickness values that ranged from 0.001 to 0.030 inches above the nominal values.

- There were no reportable pitting indications detected in any of the weld heat-affected zones. There were three areas of reportable wall thinning detected during the primary tank vertical weld scan of Plate #1. The wall thinning was confined to three small areas, approximately 12 to 30 inches below the Dome / Plate #1 horizontal weld, equivalent to tank elevations of approximately 407 to 389 inches. A total of 0.27 square inches of thinned area was identified, ranging from 0.041 to 0.063 inches deep, or 10.9% to 16.8% wall thickness reduction.

  These three areas of reportable wall thinning are also suspected to be a result of vapor space corrosion. These thinned areas will also be evaluated by a corrosion engineer to determine if an increased frequency of UT examination of these areas is warranted.

- Examinations of areas of the primary tank bottom via the air slots were planned, but were abandoned because the probe became temporarily lodged inside an air slot. Air slots were visually inspected on either side of Riser 090, but all of the slots showed some form of degradation. A management decision was made to halt further attempts to scan the tank bottom due to the possibility of the RUTI probe being permanently wedged between spalled concrete inside an air slot.

  At this time there was no reason to believe that the conditions would be different on the other side of the tank through the other 24 inch Riser 089. A decision was made not to pursue examination through the other riser at this time. The spalling of the concrete was documented via Problem Evaluation Report PER-2003-3006 and the resulting DOE Occurrence Report RP-CHG-TANKFARM-2003-0039.

- According to a recent Tank Integrity Assessment Project DST Lifecycle Schedule, tank 241-AZ-102 is scheduled for its second UT examination in about eight years. Based on the results of this UT examination, it is recommended that this schedule be maintained – there is no reason to perform any near-term follow-up inspections on this tank. Following the second UT examination, inspection parameters such as wall thinning rates can be calculated and used to better quantify and evaluate any continual wall thinning or degradation.

  A visual examination of tank 241-AZ-102 is scheduled in FY 2006 that will include visually examining the internal primary tank wall. This examination will look at areas of tank wall thinning.

13.0 FUTURE PLANNING

The M-48 Series Milestones (HFFACO 2003) requires that initial UT examinations be completed on all 28 DSTs through FY 2005. The milestones require UT examination of portions of the primary tank vertical wall, all welds on all 28 DSTs, primary tank bottoms through air slots on six DSTs, the high stress region of the primary tank lower knuckle on six DSTs, and a circumferential scan at the liquid/air interface level that existed for five years or longer on six DSTs.

Through FY 2003, UT examinations have been completed on 20 DSTs, leaving 8 remaining DSTs to be examined during FY 2004 and FY 2005 at a rate of four DSTs per year. Tanks scheduled for UT examination in FY 2004 are 241-AP-104, 241-SY-101, 241-SY-102, and 241-SY-103. In addition, a reexamination of tank 241-AN-105 is also scheduled during FY 2004. Specifics on the planned examinations are summarized in Table 13-1.

Table 13-1. UT Inspection Scope of DSTs in FY 2004

DST	Primary Tank, 30 inch wide Vertical Strip	Primary Tank, 20 ft. Horizontal Weld and 20 ft. Vertical Weld	Primary Tank Bottom	Secondary Tank Knuckle and Floor
241-AN-105*				x
241-AP-104	x	x		
241-SY-101	x	x	x	x
241-SY-102	x	x		
241-SY-103	x	x	x	

* Reexamination

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ATTACHMENT 1

AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

(COGEMA Engineering Corporation
Procedure COGEMA-SVUT-INS-007.3, Rev. 1)

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COGEMA ENGINEERING CORP.

COGEMA-SVUT-INS-007.3, Rev. 1
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AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

1.0 PURPOSE

This procedure establishes the method, equipment, and requirements for automated, direct contact, ultrasonic (UT) straight-beam, thickness measurements, angle beam flaw detection, and sizing in carbon steel waste storage tanks utilizing the "P-scan" ultrasonic imaging system.

2.0 SCOPE

2.1 Requirements

The requirements herein are applicable to weld inspection, crack detection, sizing, wall thickness measurement, and the detection of wall thinning conditions, such as pitting, erosion, and corrosion in double shell tanks from 0.100 inches to 1.0 inches in thickness. At least one side must be accessible and the component surface to be measured must be parallel with the opposite surface. The requirements are also applicable to the automated UT detection and depth sizing of surface connected planar flaws.

2.2 Scanning

Scanning is performed using remotely controlled automatic scanners.

2.3 Examinations

Examinations shall be performed from inside the annulus of the double shell tanks.

2.4 Instructions

This procedure provides the instructions for the use of Tip Diffraction Techniques including the Absolute Arrival Time Technique (AATT), and the Relative Arrival Time Technique (RATT), for the sizing of planar flaws.

2.5 Methodology

The methodology in this procedure meets the requirements as addressed in Reference 4.1 as applicable to meet the requirements for inspection of double shell tanks.

3.0 RESPONSIBILITIES

Only certified Level II or Level III ultrasonic examiners shall interpret data to determine whether it represents relevant or non-relevant indication in accordance with the applicable specification.

Level III ultrasonic examiners shall review all data collected prior to issuing a final report.

4.0 REFERENCES

4.1 ASME Boiler & Pressure Vessel Code, Section V, Article 4, 1995 Edition.

4.2 COGEMA SV-CP-PRC-014, Qualification and Certification OF NDE Personnel.

4.3 COGEMA SVAD-PRC-001, Nondestructive Examination Administrative Procedure.

4.4 COGEMA SVUT-PRC-007, Ultrasonic Examination Procedure.

4.5 FORCE Institutes, P-scan System 4 Instruction Manual

5.0 PERSONNEL REQUIREMENTS

5.1 Personnel Qualifications

Personnel performing or supervising data acquisition or performing data analysis to the requirements of this procedure shall be qualified and certified to at least level II in ultrasonics in accordance with reference 4.2 or equivalent. In addition, they shall be trained in techniques for sizing stress corrosion cracking/planar flaws.

5.2 Certification Level

Personnel performing review for final acceptance of examination data shall be certified to at least level II in ultrasonics in accordance with reference 4.2 or equivalent.

5.3 Support Personnel

Personnel, whose responsibilities are limited to set-up, tear down, and track or scanner operation need not be certified. Such personnel shall possess sufficient knowledge of the equipment to satisfy the Level III examiner.

6.0 EQUIPMENT

6.1 Ultrasonic Instrument/Examination System

The P-scan computerized pulse-echo ultrasonic inspection system shall be used. The system shall be equipped with a stepped gain control in units of 1dB with a dynamic range of at least 115 dB, capable of generating and receiving frequencies in the range of 0.5 to 15 MHz. The following components may be used:

PS-4	P-scan processor
Analysis computer	Off-line data analysis with P-scan analysis software
Digital Controller, WSC-2S, or other approved scan controller	Automatic scanner controller
AWS-5, AWS5-D, RUTI*	Automatic P-scan scanner
Pump	Couplant pump for P-scan system

*Remote Ultrasonic Inspection (RUTI) system

6.2 Transducers

Straight-beam and angle-beam transducers with single or dual elements, with or without delay tips, may be used, provided they can be attached to and manipulated by the scanner, and can be adequately coupled to the test item with a resultant backwall signal response of at least a 2 to 1 signal-to-noise ratio. Sizes and frequencies shall be as specified for the following applications:

6.2.1 For high sensitivity applications such as the detection of pitting, erosion or corrosion, transducer sizes in the range of 1/4 inch to 1/2 inch, with a frequency in the range of 4.0 to 10 MHz, shall be used.

6.2.2 For weld inspection, detection and sizing of planar flaws that are open to the surface, angle beam transducers with a nominal angle of 45 degrees with an element size in the range of 1/4 inch to 1/2 inch, with a frequency in the range of 4.0 to 10 MHz, shall be used. Where interference from weld geometry prevents examination of the required volume with a 45-degree a 60-degree angle may be substituted.

6.2.3 Transducers of other angles, element sizes, modes of propagation, or frequencies outside the above ranges may be used to suit other required examination techniques.

6.3 Cables

6.3.1 Cables of any compatible type and number of connectors may be used for examination. The length shall be limited to 400 feet, or less where signal degradation occurs. The same cables shall be used for calibration and examination.

6.3.2 The scanner control cable for analog scanners shall be limited to 330 feet maximum. Digitally controlled scanners shall have a maximum cable length as stipulated by the manufacture's recommendation.

6.4 Couplant

6.4.1 Site approved water should be used as couplant for the examination.

6.4.2 Couplant application should be accomplished by means of an automatic couplant delivery system whenever possible. Care should be taken to use only as much water as required, as excess water in the annulus is undesirable.

6.5 User Calibration Blocks

6.5.1 For general thickness measurements, or the detection of pitting, erosion, or corrosion, user calibration blocks shall be made of an acoustically similar material as that being measured. A standard step block with 0.1 inch or greater increments encompassing the nominal thickness to be measured shall be used.

6.5.2 For weld inspection, crack detection and sizing measurements, user calibration blocks shall be made of an acoustically similar material as that being measured. A standard notched block with 0.1 inch or greater increments encompassing the nominal thickness to be measured shall be used.

6.6 Reference Blocks

Reference blocks (e.g., Rompas, IIW, DSC) utilized for beam angle exit point determination or screen width calibration shall be of similar material composition as the component under examination.

6.7 Pulse Repetition Rate

The repetition rates are set at rates such that signal wrap-around does not occur. In addition, the rates are sufficient to pulse the transducer at least six times within the time necessary to move one-half the transducer dimension parallel to the scan direction at maximum scanning speed.

7.0 CALIBRATION

7.1 Verification of Instrument Linearity

Instrument alignment verification for screen height and amplitude control should be performed within three (3) months prior to use of the instrument or at the beginning and end of each outage period, whichever is less. Instrument linearity verification is independent of transducer or scanner characteristics. Verification with one transducer/scanner combination is valid for any other combination. The due date for alignment verification shall be recorded on the calibration sheet.

7.2 System Parameters

The system parameters used for calibration and examination should be established as outlined in Reference 4.5 as required. The system should be operated in the T-SCAN program for thickness mapping and zero degree inspection and in the P-SCAN program for crack detection, weld inspection and/or additional evaluation.

7.3 General Requirements

7.3.1 Calibration shall include the complete ultrasonic examination system. Any change in transducers, wedges, couplants, cables, instruments, recording devices, scanners, power source, or any other parts of the examination system shall be cause for system calibration check.

7.3.2 If a secondary ultrasonic system is to be used, it must be calibrated before the inspection is started and not removed from the examination system during the inspection or recalibration will be required.

7.3.3 System calibration checks and final calibration for instrument sensitivity and sweep range shall be performed on the same block used for initial calibration using at least one reflector. These checks shall be performed:

a) At the start and finish of each series of examinations.
b) At intervals not to exceed 16 hours.
c) When there is a change as described in 7.3.1.
d) If the examiner suspects a malfunction.

7.3.4 If the horizontal sweep, thickness, or "Z" positions have changed more than 5 percent of the nominal thickness, void all examinations performed after the last valid calibration verification, and reexamine the voided areas.

7.3.5 Calibration checks may be performed on either a reference block or the basic calibration block, but must include a check of the entire examination system. Calibration checks may be accomplished by static or dynamic calibration.

7.3.6 Simulated calibration checks may be used in lieu of calibration checks where the spread of contamination or serious time constraints would result from performing a standard calibration check. Simulated calibration will use blocks, cables, or transducers of similar types and lengths as those used for testing and will be documented on the calibration data sheet. A baseline, simulated calibration shall be performed immediately after performing the initial calibration, or after a calibration check where the entire examination system is utilized. The initial simulated calibration check values are independent of the values obtained utilizing the entire examination system. The established tolerance applies to the subsequent simulated calibration checks.

7.3.7 During calibration, the temperature of the calibration block should be within 25 degrees of the ambient inspection temperature.

7.4 Calibration Process for Thickness Mapping / T-scan

The basic process for calibration is the same for thickness mapping (T-scan), weld inspection, flaw detection, and sizing. The calibration reflectors for straight beam are the backwall reflections from a step wedge. The reflectors for angle beam transducers are the notch base and tips from a notched block. The calibration process is as follows:

7.4.1 Select and connect the appropriate transducer(s), input the parameters, including thickness, frequency, index delay, gates, inspection method(s), and velocity. Apply the couplant to the applicable points on the calibration standard. (Select a sufficiently thin step for detection of unexpected low reading or pits and a step greater than the maximum thickness expected).

7.4.2 Place the transducer(s) on the calibration step nearest to the nominal thickness of the item to be examined. Adjust the gain control to produce a reflection of 80% full screen height (FSH). Input this gain level as the reference level. Obtain a response from the other calibration points, and verify that they produce an acceptable signal. Initial calibration accuracy will be within +/- 0.010". in T-scan. Perform steps 7.4.1 and 7.4.2 for each physical transducer being used.

7.4.3 Position the transducer to produce a response from the smaller of the two (2) steps to be used for calibration. Using the scan menu, collect a reading from that step. The transducer may be removed from the scanner and remain stationary "static" while the scanner is manipulated to make a larger indication on the screen.

7.4.4 Position the transducer on the thicker step and collect data from that step. Using the level control, measure the thickness from each step. Adjust the system to read the correct thickness with index delay and velocity if needed.

7.4.5 Repeat these steps as required until the system is accurately measuring the thickness over the entire inspection range with each transducer/active inspection. During initial calibration, all intermediate steps within the inspection range should be confirmed.

7.4.6 The vital parameters used for the calibration shall be identical to the inspection parameters with the exceptions of file name(s), X, Y and Z ranges, reference level compensations, thickness, gates or comment parameters which may be adjusted as required.

7.4.7 At a minimum, readings from the thinnest and thickest calibration reflectors shall be recorded for each applicable transducer on the Automated Ultrasonic Thickness Calibration Sheet (Attachment 4).

7.5 Calibration Process for Weld Inspection / Crack Detection / P-scan

7.5.1 Select and connect the appropriate transducer(s), input the parameters, including thickness, frequency, index delay, gates, inspection method(s), and velocity. Apply the couplant to the applicable points on the calibration standard. The 5%T notch on a 1" thick plate should be used to obtain the reference level.

7.5.2 Manipulate the transducer to receive the maximum response from the reference notch. Adjust the gain control to produce a reflection of 80% full screen height (FSH). Input this value as the reference level. Obtain a response from the calibration reflector and verify that the response is within +/- 2dB.

7.5.3 Position the transducer to produce a response from the reference reflector. Using the scan menu, collect data from that notch. The transducer may be removed from the scanner and remain stationary "static" while the scanner is manipulated to make an indication on the screen.

7.5.4 Use the level control to determine the peak amplitude and the position of the indication at the peak amplitude. Use index delay and velocity (if required) to adjust the system to plot the reflectors in the appropriate positions. The ID notch should plot on the ID at or near the peak amplitude.

7.5.5 Repeat steps 7.5.2 through 7.5.3 as required for each transducer until the system is calibrated.

7.5.6 The vital parameters used for the calibration shall be identical to the inspection parameters with the exceptions of file name(s), X, Y and Z ranges, reference level compensations, thickness, gates or comment parameters which may be adjusted as required.

7.5.7 The calibration reflector(s) and response shall be recorded for each applicable transducer on the Automated Ultrasonic P-Scan Calibration Sheet (Attachment 7).

7.6 Sizing Calibration for Tip Diffraction Techniques (AATT, RATT)

a) Select an appropriate transducer.

b) Select a sizing calibration block of similar thickness and material containing at least two notches of known depths.

c) For the AATT technique, set at least two gates, to cover the entire area of interest. The first gate in the first leg, ending just before the ID. Position the transducer on the calibration block. Alternately peak the shallow and deep signals from the notch tips (see Attachment 6). Using the index delay and velocity controls, adjust the system until the system correctly reads the remaining ligament with the "Z" cursor.

d) For the RATT technique, the system mode should be set to A-SCAN. Manipulate the transducer until signals are obtained from the shallow notch tip and the notch base simultaneously (see Figure 2, Attachment 6). Using the index delay and velocity, adjust the distance between the two signals to read the actual reflector depth in inches. Repeat the same process on the deep notch. Alternate this procedure until the screen/system represents a desirable linear depth screen in inches.

e) Save the calibration, and record this data on the Automated Ultrasonic P-Scan Calibration Sheet (Attachment 7).

8.0 EXAMINATION

8.1 Surface Condition

8.1.1 The surface from which measurements are to be taken should be free of loose scale, unbonded coating, heavy oxidation, weld spatter, or other material which may interfere with movement of the transducer or the transmission of sound into the material.

8.1.2 A surface finish of 250 RMS or better should be provided. The requesting organization must approve the use of any base material preparation process, which may reduce the thickness below the allowable tolerance.

8.2 Extent of Examination

The location of the areas to be measured and/or the number of scans to be performed shall be designated by the applicable work instructions. The location, scan numbers, and reference points of all scans shall be recorded on the applicable data sheets. See attachment 1 for minimum examination volume and beam direction for weld inspection.

NOTE: Additional scan areas will not require revision to this procedure.

8.3 Flaw Location

When performing examinations to detect planar flaws, angle beam transducers shall be used. Calibration is performed as in Section 7.5. All angle beam examinations shall be performed in P-scan.

8.4 Ultrasonic Measurement

User calibration shall have been completed per the applicable requirements of Section 7.0 prior to performing any of the examinations.

8.4.1 The amplitude of the first back reflection obtained from the item to be examined shall be adjusted as necessary using the Transfer Correction to maintain approximately the same amplitude as that used for calibration. The dB value obtained with straight beam transducer should be recorded on the report. This value should be considered during analysis of P-scan angle beam data also.

8.4.2 Transducer overlap between passes shall be a minimum of 50% of the element size. Scanning speed shall not exceed 6 inches per second.

8.4.3 Should measurements be observed larger or smaller than the range calibrated for in Section 6.0, check the calibration for accuracy in the encountered thickness range. If the calibration is accurate in this range, amend the calibration sheet and continue the examination. If the calibration is not within the tolerance allowed in the spec, then recalibrate and rescan all areas where readings were encountered outside the originally calibrated range.

8.5 Limitations and Precautions

8.5.1 Care must be taken to ensure the transducer face is flush with the examination surface during scanning.

8.5.2 When it is necessary to determine the origin of mid-wall indications, a 4MHz shear wave transducer(s) may be used in the P-Scan program to detect pit openings or perpendicular connections between laminar indications.

8.6 Recording

Upon completion of each scan area, the data file(s) shall be recorded on a disk. All measurements within the predetermined gated area are stored, along with the text information with each file.

8.7 General Sizing Guidelines

8.7.1 It is recognized that, of the methods of sizing described in this procedure, no one technique is completely accurate in sizing all flaws in all thicknesses. By using complementary methods, however, a realistic approximation of the flaw depth can be obtained.

8.7.2 The method of sizing pits is primarily utilizing a zero degree dual element transducer. The 45-degree shear wave transducers may be used to confirm qualitatively the depth of the pit.

8.7.3 When sizing crack-like indications, the entire flawed area shall be scanned with the imaging mode. The entire flaw length shall be evaluated. It is recommended that A-Scans be recorded at the <u>deepest</u> location of the flaw. The primary technique for sizing crack-like indications is the high frequency, 45 degree shear wave transducer utilizing the Absolute Arrival Time Technique (AATT). The dual element, straight beam may be used as a complimentary technique.

8.7.4 Additional sizing technique sequences may be utilized if the primary techniques identified prove to be indeterminable.

8.8 Sizing with Tip Diffraction Techniques (AATT, RATT)

8.8.1 The AATT technique uses shear waves to obtain a diffracted echo (satellite pulse) from the flaw tip (see Figure 1 Attachment 6). The RATT technique uses shear wave reflected signals from both the flaw tip and the flaw base (see Figure 2 Attachment 6). Both techniques can be utilized using the same transducer.

a) <u>AATT Technique</u>

Locate the deepest extremity of the flaw and maximize the signal from the flaw tip. The distance to the flaw tip represents the remaining material ligament from the outside surface. To determine the relative through wall flaw depth, subtract this dimension from the local material wall thickness.

b) <u>RATT Technique</u>

Locate the deepest extremity of the flaw, and obtain a signal from the flaw base. Manipulate the transducer until the doublet (flaw base and tip signal appearing simultaneously) is observed. These signals do not have to be peaked, as the doublet separation directly indicates the relative through wall depth. To determine remaining material ligament, subtract the relative through wall depth measurement from the local material wall thickness.

8.8.2 Other sizing techniques or variations to the techniques may be used with the approval of the UT Level III. Such approval, signature and a description of the technique shall be recorded in the "Remarks" column on the Ultrasonic Sizing Calibration Sheet (Attachment 7).

9.0 EVALUATION

9.1 Relevant Indications

Relevant indications including pitting, thinning and crack-like indications along with the minimum thickness reading in the area of interest shall be recorded and used for evaluation per Paragraph 9.2.

9.1.1 P-scan data shall be evaluated to a sensitivity of 20% reference level (-14dB). All crack-like indications are recordable regardless of amplitude.

9.1.2 T-scan data shall be evaluated utilizing all available images to detect and evaluate indications.

9.1.3 Reportable indications shall be evaluated by Level III personnel prior to final report submittal.

9.2 Reporting/Special Criteria

Reporting and special notification criteria are noted in Section 9.8.

9.3 Statistical Information

The statistical information (Minimum and Mean thickness) provided under "Setup" pages 1 & 2 of the post-processing software should be reported for each "Part" of a given scan location. Where data noise invalidates these values, the analyst should determine the values using the level control.

9.4 Printouts

Printouts should be made in accordance with the customer's request. In absence of further direction, both the merged set-up pages and the merged image, adjusted to show the minimum thickness, shall be printed at a level that best shows the wear patterns or at Nominal T - 12.5%, whichever provides the most useful information. P-scan data should be printed with the level control set at 20% reference level (-14dB).

9.5 Recording Crack Size

9.5.1 All flaw sizing data acquired should be used to determine the flaw depth. This data shall be reported individually for each flaw and shall include all data necessary to achieve the best accuracy of flaw depth.

9.5.2 If, during sizing, a <u>flaw length other than that reported during the detection examination</u> is measured, or other discrepant conditions occur, record the corrected lengths, locations. or distances on the Ultrasonic P-scan Data Report (Attachment 8) in the spaces provided.

9.5.3 If, during sizing, the area is determined <u>not to be flawed</u>, and the resultant reflector(s) is due to component/weld geometry or metallurgical structure, the true origin (e.g., root, mismatch, etc.) shall be documented and substantiated on the Ultrasonic P-scan Data Report.

9.6 Scanning Limitations

Record all limitations due to weld configurations, obstructions, single side access restrictions, etc., in the remarks section on the applicable Ultrasonic Data Report. Details as to specific length or area in relation to L (X) and/or W (Y) reference points should be recorded.

9.7 Flaw Evaluation

Reportable indications shall be evaluated by Level III personnel prior to final report submittal.

9.8 Reporting Levels

All indications which meet or exceed the following conditions shall be reported to the project cognizant engineer.

a) Pit depth exceeds 25% of the wall thickness.

b) Wall thinning exceeds 10% of the wall thickness.

c) Surface crack depths <u>exceeding</u> 0.18 inches.

10.0 REPORTS

10.1 Thickness Data Reports

An Automated Ultrasonic Thickness Data Report (Attachment 3) shall be prepared for each examination or series of examinations performed. This report shall include identity of equipment, the thickness measurements obtained, and should be referenced to the calibration sheet.

10.2 Calibration Reports

An Automated Ultrasonic Examination Calibration Sheet (Attachment 4) shall be prepared for each examination or series of examinations performed. This report shall include the materials and equipment used for examination.

10.3 Sketch Sheets

An Automated Ultrasonic Examination Sketch Sheet (Attachment 5) should be prepared for each examination or series of examinations performed. This report should include identity of scanning equipment and a sketch of the component or item examined, identifying scan locations, including dimensions, reference points, and grid locations, where applicable.

10.4 Sizing Data Reports

An Ultrasonic Sizing Data Report (Attachment 8) shall be completed only when cracking is detected. Each report shall be related to the applicable Automated Ultrasonic Examination Calibration Sheet(s).

10.5 Cover Sheets

Whenever several locations are being examined on the same conponent an Automated Ultrasonic Examination Report Cover Sheet (Attachment 1) and an Automated Ultrasonic Thickness Report Summary Sheet (Attachment 2) should be completed.

10.6 Final Reports

Final reports are to be distributed and maintained in accordance with the applicable contract.

11.0 ATTACHMENTS

11.1 Attachment 1: Examination Volume, Minimum Beam Directions and Extent of Examination

11.2 Attachment 2: Sample Automated Ultrasonic Thickness Data Report

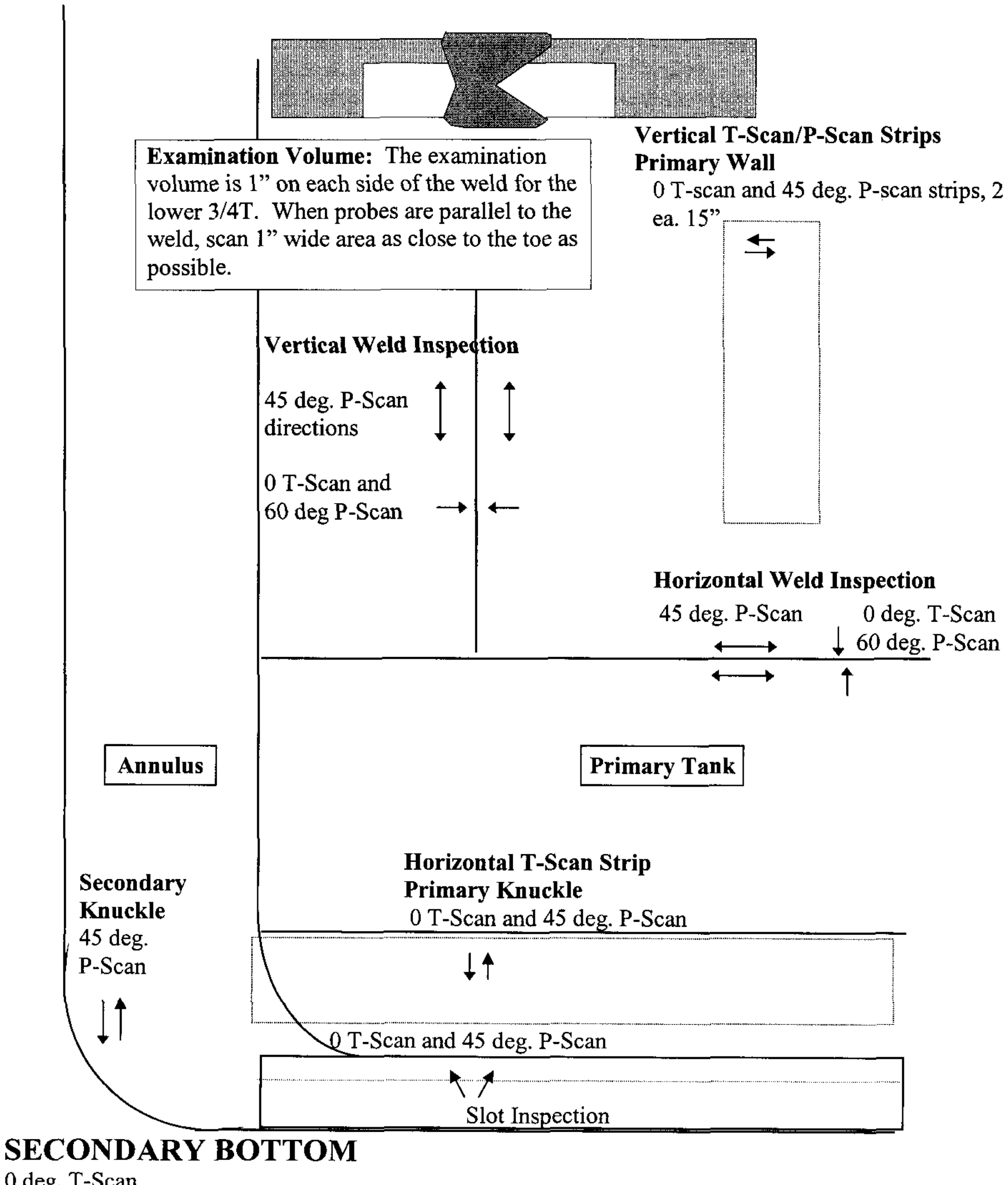
11.3 Attachment 3: Sample Automated Ultrasonic Thickness Calibration Sheet

11.4 Attachment 4: Figure 1: Absolute Arrival Time Technique (AATT)
Figure 2: Relative Arrival Time Technique (RATT).

11.5 Attachment 5: Sample P-scan Calibration Data Sheet

11.6 Attachment 6: Sample Ultrasonic P-scan Data Report

Attachment 1: Examination Volume, Minimum Beam Directions and Extent of Examination



Attachment 1 (continued): Extent of Examination

Primary Tank Wall

Vertical Strips - Examine a vertical strip 30" x 35 feet long of the primary wall between the upper haunch transition and the lower knuckle for pits, cracks and wall thinning. Axial cracks on the tank inner wall surface shall be detected and sized. The vertical strip may be comprised of one or more strips whose total width is equal to 30 inches.

Weld Areas - Examine 20 feet of horizontal weld area (heat affected zone), at tank to knuckle weld. Examine one ~10 foot section of vertical weld joining the lowest shell course plates and one ~10 foot section of vertical weld joining the next to lowest shell course plates. Axial and circumferential cracks on the tank inner surface shall be detected and sized.

Primary Tank Knuckle

Examine 20 feet of the primary tank lower knuckle in the circumferential direction to detect and size cracking in the circumferential direction and to detect pits and wall thinning. The area to be examined is from the weld joining the transition plate with the knuckle to the furthest reach of the transducer assembly that is allowed by geometric constraints.

Secondary Tank

Secondary Tank Lower Knuckle – Examine a 20 foot length of the secondary tank knuckle over the entire area of the knuckle for the presence of circumferential cracks.

Secondary Tank Bottom – Examine the secondary tank bottom over an area of 10 ft^2 to detect and measure thickness and pits.

Primary Tank Bottom

Examine the primary tank bottom for pits, wall thinning and cracks oriented in the circumferential direction (perpendicular to the air channels) in 16 air channels. The tank bottom is to be examined for a distance of 12 feet towards the tank center, starting seven inches inboard of the outside radius of the tank cylindrical section. The primary tank bottom scan head is designed to examine the accessible area in the air channel in one pass through the channel.

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AUTOMATED ULTRASONIC EXAMINATION FOR CORROSION AND CRACKING

Attachment 2: Sample Automated Ultrasonic Thickness Data Report

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
COMPONENT ID		EXAMINATION SURFACE ☐ OD ☐ ID ☐ PAINTED		NOM. THICKNESS
CONFIGURATION	TO	CALIBRATED RANGE		TEMP °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED		REF. LEVEL CORRECTION (TRANS. CORR) ______ DB		
PROCEDURE	REV	MATERIAL TYPE ☐ SS ☐ CS OTHER ______		CONDITION
FILE NAME/ITEM#		TRANSDUCER ☐ DUAL ☐ SGL ☐ 0DEG ☐ ANGLE ____		
X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH		

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	COMMENTS
SUMMARY								

REMARKS ____
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Examiner	Analyst	Reviewer	Page
____________	____________	____________	
Level ___ Date _______	Level ___ Date _______	Level ___ Date _______	___ of ___

Attachment 3: Sample Automated Ultrasonic Thickness Calibration Sheet

4/00	**AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET**	

LOCATION	SYSTEM	CALIBRATION BLOCK	
PROCEDURE		THICKNESS	MATERIAL
UT SYSTEM	SERIAL #	REFERENCE BLOCK	
SOFTWARE VERSION	REV.	THICKNESS	MATERIAL
LINEARITY DUE DATE		REFERENCE BLOCK TEMP °F	PYRO SN.
SCANNER TYPE	SERIAL #	COUPLANT	BATCH #
SCANNER CABLE		CABLE LENGTH	CABLE #
SIGNAL CABLE		CABLE LENGTH	CABLE #

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ.	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1									
2									
3									
4									

INITIAL CALIBRATION		CALIBRATION CHECKS							
DATE									
TIME									
REFLECTOR									
CH. 1	THK.1								
	THK. 2								
CH. 2	THK.1								
	THK. 2								
CH. 3	THK.1								
	THK. 2								
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS______________________________

Examiner	Examiner	Reviewer	
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Attachment 4: Absolute Arrival Time Technique (AATT) & Relative Arrival Time Technique (RATT)

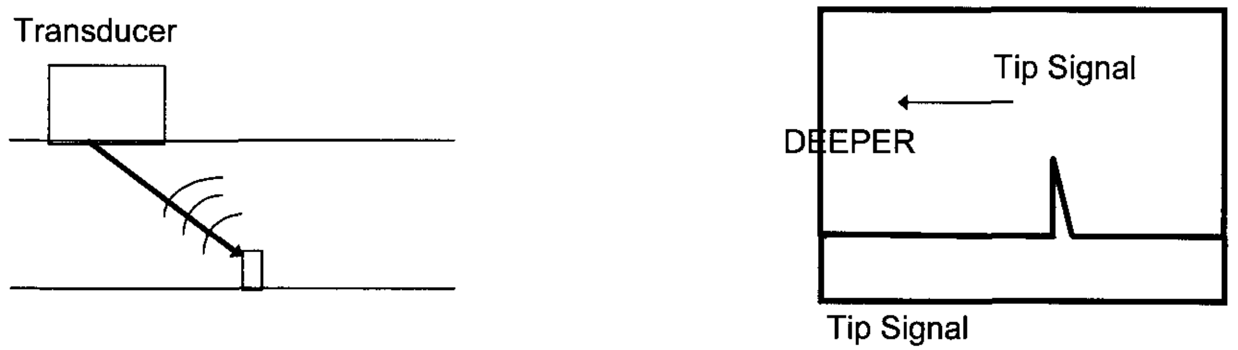

Figure 1. Absolute Arrival Time Technique

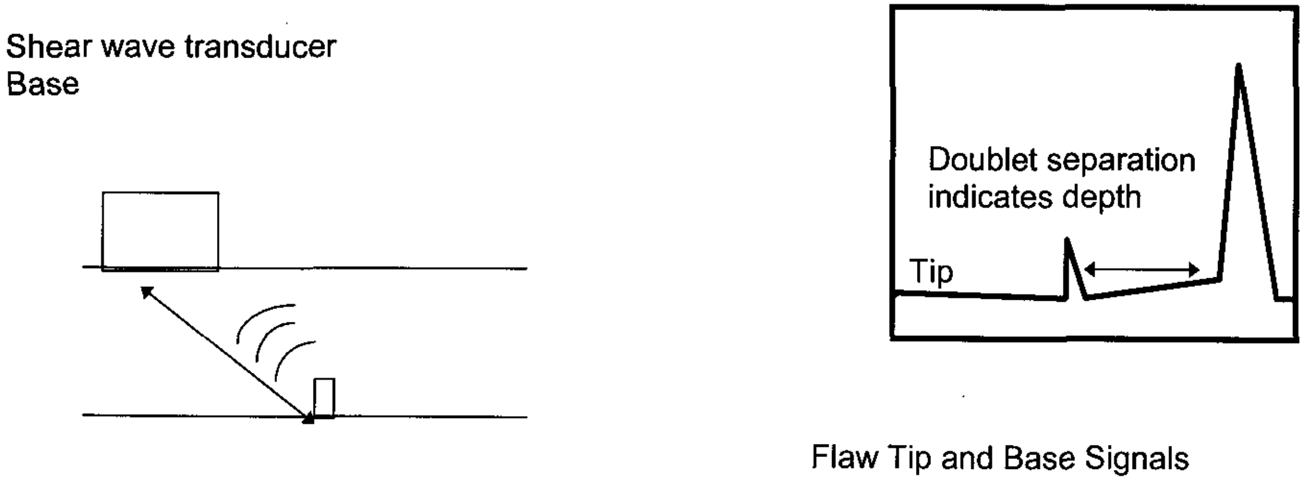

Figure 2. Relative Arrival Time Technique

Attachment 5: Sample P-scan Calibration Sheet

4/00	**AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET**	

LOCATION	SYSTEM	CALIBRATION BLOCK	
PROCEDURE		THICKNESS	MATERIAL
UT SYSTEM	SERIAL #	REFERENCE BLOCK	
SOFTWARE VERSION	REV.	THICKNESS	MATERIAL
LINEARITY DUE DATE		REFERENCE BLOCK TEMP °F	PYRO SN.
SCANNER TYPE	SERIAL #	COUPLANT	BATCH #
SCANNER CABLE		CABLE LENGTH	CABLE #
SIGNAL CABLE		CABLE LENGTH	CABLE #

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ.	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE
1									
2									
3									
4									

INITIAL CALIBRATION			CALIBRATION CHECKS						
DATE									
TIME									
REFLECTOR / ORRIENTATION									
CH. 1	AMPLITUDE								
	LOCATION								
CH. 2	AMPLITUDE								
	LOCATION								
CH. 3	AMPLITUDE								
	LOCATION								
CH. 4	AMPLITUDE								
	LOCATION								
FILE #									
EXAMINER									

REMARKS ____

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Attachment 6: Sample P-scan Data Report

4/00 — **ULTRASONIC P-SCAN DATA REPORT**

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
COMPONENT ID		EXAMINATION SURFACE ☐ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION	TO	CALIBRATED RANGE		TEMP °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED		REF. LEVEL CORRECTION (TRANS. CORR) ______ DB		
PROCEDURE	REV	MATERIAL TYPE ☐ SS ☐ CS OTHER ______		
FILE NAME/ITEM#		TRANSDUCER ☐ DUAL ☐ SGL ☐ 0DEG ☐ ANGLE ____		
X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS
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Examiner	Analyst	Reviewer	Page
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ATTACHMENT 2

ULTRASONIC EXAMINATION OF THE KNUCKLE REGION

**(COGEMA Engineering Corporation
Procedure COGEMA-SVUT-INS-007.5, Rev. 0)**

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ULTRASONIC EXAMINATION OF THE KNUCKLE REGION

1.0 PURPOSE

This procedure establishes the method, equipment, and requirements for the direct contact, ultrasonic angle beam flaw detection and sizing, in the knuckle region of Hanford's carbon steel double shell tank's (DSTs) utilizing the Remotely Operated Nondestructive Examination (RONDE) ultrasonic imaging system.

2.0 SCOPE

2.1 Requirements

The requirements herein are applicable to examination of the knuckle region of Hanford's DSTs utilizing the RONDE ultrasonic imaging system. The RONDE system provides ultrasonic detection and sizing of surface connected planar flaw (i.e. cracks) that are oriented circumferentially around the tank in the knuckle region.

2.2 Scanning

Scanning is performed using a remotely controlled scanner.

2.3 Examinations

Examinations shall be performed from inside the annulus region of the DSTs.

2.4 Instructions

This procedure provides the instructions for the use of the RONDE system in the pitch-catch mode for detection of planar flaws oriented circumferentially in the knuckle region of the DSTs and in the Tandem SAFT (T-SAFT) mode for depth sizing of planar flaws oriented circumferentially in the knuckle region of the DSTs.

2.5 Methodology

The methodology in this procedure meets the applicable requirements addressed in Reference 4.1 as applicable to meet the requirements for inspection of the double shell tank knuckle region.

3.0 RESPONSIBILITIES

Only certified Level II or Level III ultrasonic examiners shall interpret data to determine whether they represent relevant or non-relevant indications in accordance with the applicable specification. Level III ultrasonic examiners shall review all data collected prior to issuing a final report.

4.0 REFERENCES

4.1 ASME Boiler & Pressure Vessel Code, Section V, Article 4, 1995 Edition.

4.2 COGEMA SVCP-PRC-014, Qualification and Certification of NDE Personnel.

4.3 COGEMA SVAD-PRC-001, Nondestructive Examination Administrative Procedure.

4.4 COGEMA SVUT-PRC-007, Ultrasonic Examination Procedure.

4.5 RONDE Instruction Manual

5.0 PERSONNEL REQUIREMENTS

5.1 Personnel Qualifications

Personnel performing or supervising data acquisition or performing data analysis to the requirements of this procedure shall be qualified and certified to at least Level II in ultrasonics in accordance with reference 4.2 or equivalent. In addition, they shall be trained in techniques for sizing stress corrosion cracking/planar flaws using SAFT/T-SAFT.

5.2 Certification Level

Personnel performing review for final acceptance of examination data shall be certified to at least Level II in ultrasonics in accordance with reference 4.2 or equivalent.

5.3 Support Personnel

Personnel, whose responsibilities are limited to set-up, tear down, and track or scanner operation need not be certified. Such personnel shall possess sufficient knowledge of the equipment to satisfy the Level III examiner.

6.0 EQUIPMENT

6.1 Ultrasonic Instrument/Examination System

The RONDE ultrasonic system shall be used for the examination of the knuckle region of the Hanford DST's. The system shall be equipped with a stepped gain control in units of 1 dB with a range of at least 75 dB, capable of generating and receiving frequencies in the range of 0.5 to 5 MHz. The following components may be used:

RITEC	Pulser/Receiver
Intel P4/2.5 GHZ	Acquisition Computer
Compumotor/Precision Motion Control	Stepper Motors and Control
GXS-MC-2600	Magnetic Wheel Crawler
Pump	Couplant Pump for RONDE System
Dell	Data Acquisition and Analysis Computers

6.2 Transducers

Angel beam transducers that produce shear waves at 70 degrees shall be used for the knuckle region inspection. The transducer diameter shall be approximately 0.5 inches, with a center frequency of approximately 3.5 MHz.

6.3 Cables

Cables of any compatible type and number of connectors may be used for the examination. The length of the cables between the tank top electronics enclosure and the scanning crawler should not be greater than 100 feet. The length of cables between the tank top electronics enclosure and the control trailer should not exceed 425 feet.

6.4 Couplant

6.4.1 Site approved water should be used as couplant for the examination.

6.4.2 Couplant application should be accomplished by means of an automatic couplant delivery system whenever possible. Care should be taken to use only as much water as required, as excess water in the annulus is undesirable.

6.5 User Calibration Blocks

For crack detection and sizing measurements, user calibration blocks shall be made of an acoustically similar material as that being measured.

6.6 Reference Blocks

Reference blocks (e.g. Rompas, IIW, DSC) utilized for beam angle exit point determination or screen width calibration shall be of similar material composition as the component under examination.

6.7 Pulse Repetition Rate

The repetition rates are set at rates such that signal wrap-around does not occur.

7.0 CALIBRATION

7.1 Verification of Instrument Linearity

Instrument alignment verification for screen height and amplitude control linearity should be performed within three (3) months prior to use of the instrument or at the beginning and end of each outage period, whichever is less. Instrument linearity verification is independent of transducer or scanner characteristics. Verification with one transducer/scanner combination is valid for any other combination. The due date for alignment verification shall be recorded on the calibration sheet.

7.2 System Parameters

The system parameters used for calibration and examination should be established as outlined in Reference 4.5 as required.

7.3 General Requirements

7.3.1 Calibration shall include the complete ultrasonic examination system. Any change in transducers, wedges, couplants, cables, instruments, recording devices, scanners, power source, or any other parts of the examination system shall be cause for system calibration check.

7.3.2 System calibration checks and final calibration for instrument sensitivity and sweep range shall be performed on the same block used for initial calibration using at least one reflector. These checks shall be performed:

a) At the start and finish of each series of examinations.
b) At intervals not to exceed 16 hours.
c) When there is a change as described in 7.3.1.
d) If the examiner suspects a malfunction.

7.3.3 During calibration, the temperature of the calibration block should be within 25 degrees Fahrenheit of the ambient inspection temperature.

7.4 Calibration Process for Knuckle Crack Detection and Sizing

7.4.1 Select and connect the two appropriate transducers (X1 and X2). Verify the parameters, including thickness, frequency, and velocity. Place the SAFT/T-SAFT Scanning Bridge on the calibration fixture. Apply the couplant to the applicable point on the calibration standard. The 10%T notch on a 0.875-inch thick plate should be used to obtain the reference level.

7.4.2 Assure transducers are in the park position. Translate X1 and X2 transducers one inch to the start of scan sequence. Position gain control knob to 20 dB. Acquire one 10-inch line of data. Envelope detect and project this data file. Utilizing the SAFT Analyses code, record the amplitude from the 10% notch. For later amplitude calibration checks, verify that the amplitude is within ± 3dB. Also record the distance between the 10% notch and the end of the plate signal. Verify that this distance is within ± 0.1 inch of the calibration standard.

7.4.3 The vital parameters used for the calibration shall be identical to the inspection parameters with the exception of file names, X, Y, and Z ranges, reference level compensations, thickness, velocity, or comment parameters, which may be adjusted as required.

7.4.4 The calibration reflector response and distance between notch and end of plate shall be recorded for each transducer pair on the SAFT/T-SAFT Ultrasonic Examination Calibration Sheet (Attachment 2).

8.0 EXAMINATION

8.1 Surface Condition

8.1.1 The surface from which measurements are to be taken should be free of loose scale, unbonded coating, heavy oxidation, weld spatter, or other material, which may interfere with movement of the transducer or the transmission of sound into the material.

8.1.2 A surface finish of 250 RMS or better should be provided. The requesting organization must approve the use of any base material preparation process, which may reduce the thickness below the allowable tolerance.

8.2 Location of the Scanning Bridge

The location of the scanning bridge is critical in providing consistent and repeatable data acquisition. Location of the lower feet of the scanning bridge just below the upper knuckle weld is the desired position.

8.3 Extent of Examination

See Attachment 1 for examination parameters of the knuckle region. The location, scan numbers, and reference points of all scans shall be recorded on the applicable data sheets.

8.4 Ultrasonic Measurement

User calibration shall have been completed per the applicable requirements of Section 7.0 prior to performing any of the examinations.

8.4.1 Transducer overlap between passes shall be a minimum of 50% of the element size for planar flaw detection and sizing. Scanning speed shall not exceed 6 inches per second.

8.4.2 Should measurements be observed larger or smaller than the range calibrated for in Section 7.0, check the calibration for accuracy in the encountered thickness range. If the calibration is accurate in this range, amend the calibration sheet and continue the examination. If the calibration is not within the tolerance allowed in the spec, then recalibrate and rescan all areas where readings were encountered outside the originally calibrated range.

8.5 Limitations and Precautions

8.5.1 Care must be taken to ensure the transducer face is flush with the examination surface during scanning.

8.6 Recording

Upon completion of each scan area, the data file(s) shall be saved on the hard drive.

8.7 Flaw Detection and Location

Flaw detection and location shall be performed using the pitch-catch mode. Data is analyzed to provide the detection of the planar flaw, location, and length sizing in the knuckle region.

8.8 General Sizing Guidelines

8.8.1 T-SAFT provides a means for sizing the depth or through-wall dimension of vertically oriented planar defects.

8.8.2 T-SAFT uses a transmitting and receiving transducer pair in a pitch-catch arrangement.

8.8.3 When sizing planar defects, the entire flawed area shall be scanned in the T-SAFT mode and evaluated.

8.9 Sizing Utilizing the T-SAFT Technique

8.9.1 The peak response from the corner trap of the planar flaw is used to initially set up the T-SAFT scanning. Location of this corner trap is found using the pitch-catch data.

8.9.2 For T-SAFT data acquisition, the two tandem transducers are positioned side by side at the peak (corner trap) response location.

8.9.3 The transmit and receive transducers are moved in opposite directions approximately 4 inches (or as much as possible) prior to initiating the T-SAFT scan.

8.9.4 The tandem data acquisition begins by scanning the two transducers towards each other, up to the mid-point of the scan (corner trap location) and continuing way from each other, to the end of the scan line. Once the scan line is complete, the pair of transducers returns to their start positions, are both incremented circumferentially (around tank), and start the next scan line.

8.9.5 Flaw depth is determined as half the distance from the upper half amplitude point to the lower half amplitude point in the B-scan views. The half amplitude points correspond to the –6dB points in the appropriate image.

8.9.6 Flaw length is determined by the loss of signal at the –10dB point from the pitch-catch corner trap signal.

9.0 EVALUATION

9.1 Relevant Indications

9.1.1 All crack-like indications are considered relevant and shall be recorded.

9.1.2 Reportable indications shall be evaluated by Ultrasonic Level III personnel prior to final report submittal.

9.2 Reporting/Special Criteria

Reporting and special notification criteria are noted in Section 9.8.

9.3 Printouts

Printouts of ultrasonic data should be made in accordance with the customer's request.

9.4 Recording Crack Size

All flaw sizing data acquired should be used to determine the flaw depth. This data shall be reported individually for each flaw and shall include all data necessary to achieve the best accuracy of flaw depth.

9.5 Scanning Limitations

Record all limitations due to weld configurations, obstructions, single side access restrictions, etc., in the remarks section on the SAFT/T-SAFT Ultrasonic Examination Data Report.

9.6 Flaw Evaluation

Reportable indications shall be evaluated by Ultrasonic Level III personnel prior to final report submittal.

9.7 Reporting Levels

All indications which meet or exceed the following conditions shall be reported to the project cognizant engineer.

- Surface crack depths exceeding 0.10 inches.

10.0 REPORTS

10.1 Calibration Reports

A SAFT/T-SAFT Ultrasonic Examination Calibration Sheet (Attachment 2) shall be prepared for each examination or series of examinations performed. This report shall include the materials and equipment used for the examination.

10.2 Sketch Sheets

A SAFT/T-SAFT Ultrasonic Examination Knuckle Sketch Sheet (Attachment 4) should be prepared for each examination or series of examinations performed. This report should include identity of scanning equipment and a sketch of the component or item examined, identifying scan locations, including dimensions, reference points, and grid locations, where applicable.

10.3 Ultrasonic Data Reports

A SAFT/T-SAFT Ultrasonic Examination Data Report (Attachment 3) shall be completed to document each examination. Each report shall be related to the applicable SAFT/T-SAFT Ultrasonic Examination Calibration Sheet(s).

10.4 Final Reports

Final reports are to be distributed and maintained in accordance with the applicable contract.

11.0 ATTACHMENTS

11.1 Attachment 1: Examination Parameters of the Knuckle Region

11.2 Attachment 2: SAFT/T-SAFT Ultrasonic Examination Calibration Sheet

11.3 Attachment 3: SAFT/T-SAFT Ultrasonic Examination Data Report

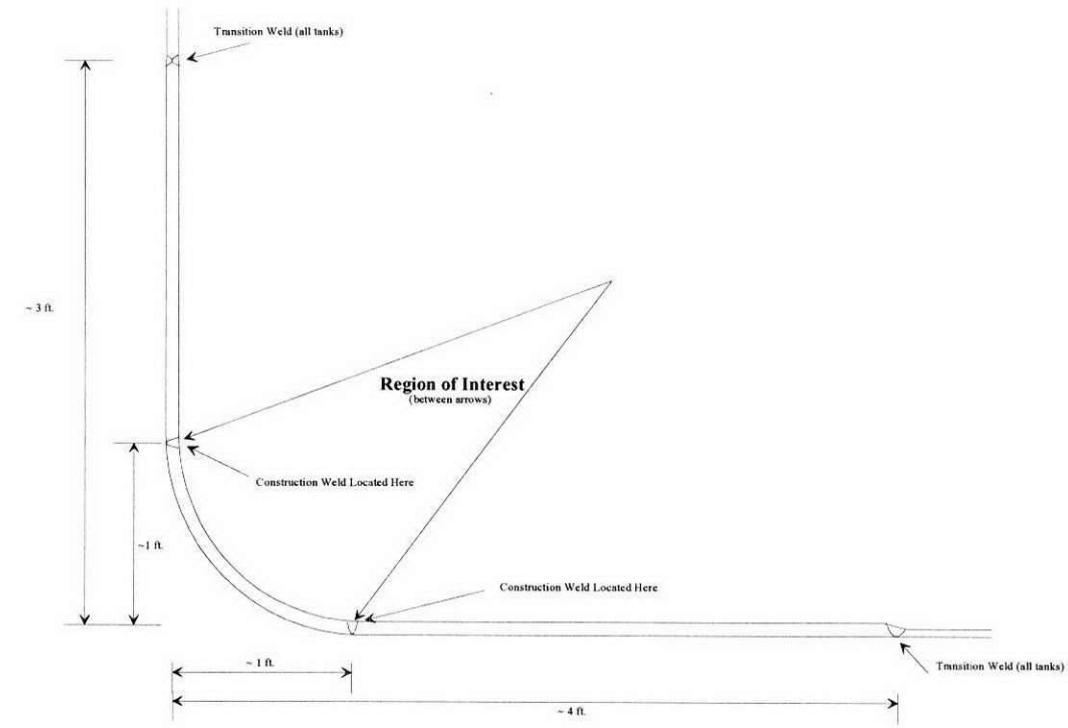
11.4 Attachment 4: Knuckle Sketch Sheet

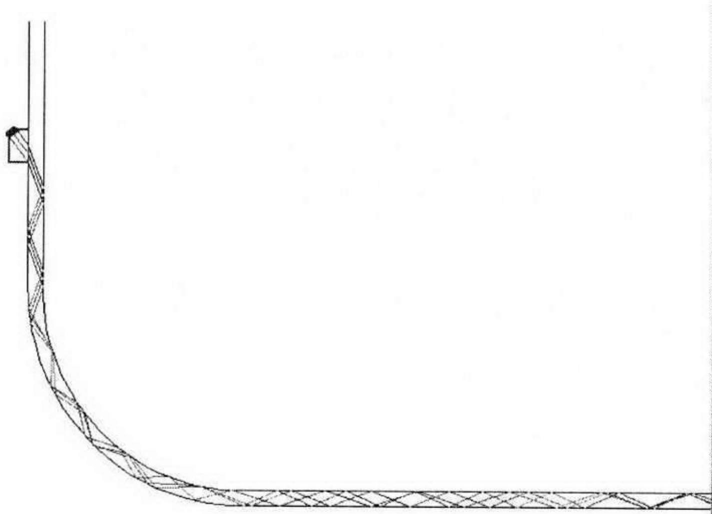
COGEMA ENGINEERING

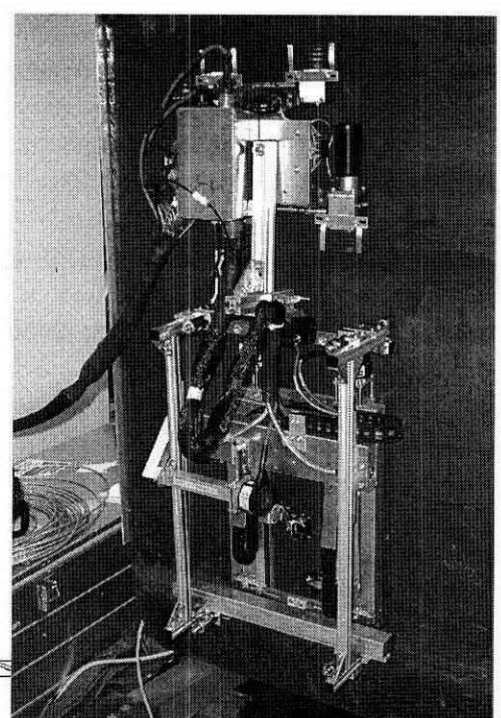
COGEMA-SVUT-INS-007.5, Rev. 0
UNCONTROLLED COPY

ULTRASONIC EXAMINATION OF THE KNUCKLE REGION

ATTACHMENT 1: EXAMINATION PARAMETERS OF THE KNUCKLE REGION







COGEMA ENGINEERING

COGEMA-SVUT-INS-007.5, Rev. 0
UNCONTROLLED COPY

ATTACHMENT 2: SAFT/T-SAFT ULTRASONIC EXAMINATION CALIBRATION SHEET

10/02	**SAFT/T-SAFT ULTRASONIC CALIBRATION SHEET**		
LOCATION	SYSTEM	CALIBRATION BLOCK	
PROCEDURE	REV	THICKNESS	MATERIAL
UT SYSTEM	SERIAL #	REFERENCE BLOCK	
SOFTWARE VERSION	REV	THICKNESS	MATERIAL
LINEARITY DUE DATE		REFERENCE BLOCK TEMP °F	PYRO SN.
SCANNER TYPE	SERIAL #	COUPLANT	BATCH #
SCANNER CABLE		CABLE LENGTH	CABLE #
SIGNAL CABLE		CABLE LENGTH	CABLE #

TRANSDUCER INFORMATION

TRANSDUCER #	TRANSDUCER MAKE	MODEL	FREQ	SIZE	SERIAL #	WEDGE TYPE	ANGLE
X1							
X2							

CALIBRATION CHECKS

DATE	CAL IN	CAL OUT	END OF BLOCK	NOTCH	DIFF	AMPLITUDE	DIFF	FILE NAME

REMARKS

____

EXAMINER	EXAMINER	REVIEWER	PAGE
LEVEL ____ DATE ____	LEVEL ____ DATE ____	LEVEL ____ DATE ____	____ OF ____

COGEMA ENGINEERING

COGEMA-SVUT-INS-007.5, Rev. 0
UNCONTROLLED COPY

ULTRASONIC EXAMINATION OF THE KNUCKLE REGION

ATTACHMENT 3: SAFT/T-SAFT ULTRASONIC EXAMINATION DATA REPORT

10/02

SAFT/T-SAFT ULTRASONIC DATA REPORT

LOCATION	SYSTEM	EXAM START	EXAM END	JOB#
COMPONENT ID		EXAMINATION SURFACE ☐ OD ☐ ID		
CONFIGURATION			TEMP	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED				
PROCEDURE	REV	MATERIAL TYPE	NOM. THICKNESS	
FILE NAME		TRANSDUCERS (2)	WEDGES	
Y (CIRCUMFERENCE) START POSITION	T-SAFT FILE NAME			

T-SAFT INFORMATION

T-SAFT FILE NO.	Y START	Y STOP	X POSITION	LENGTH	DEPTH	SCANNER X POSITION

REMARKS

____

____

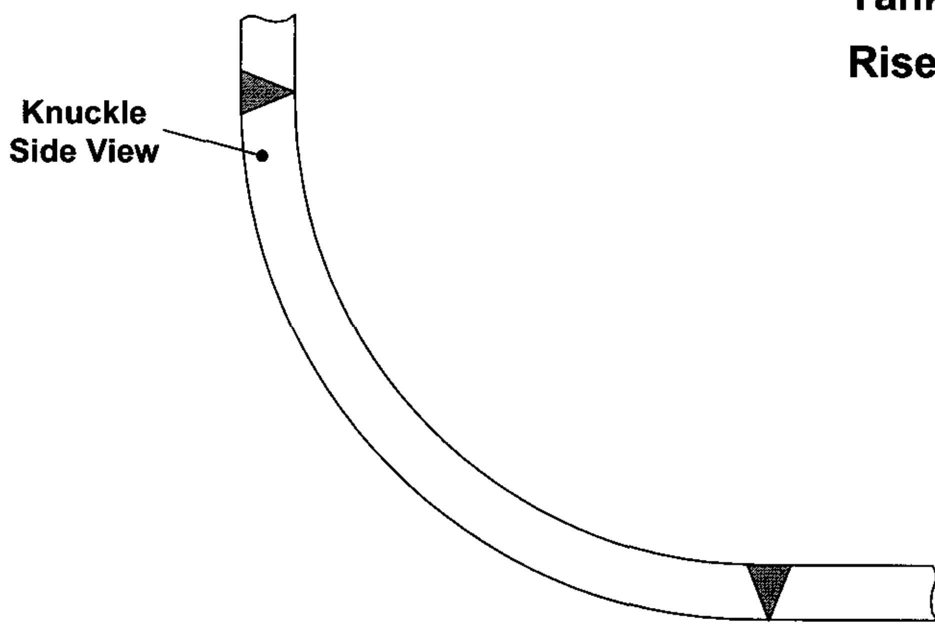
____

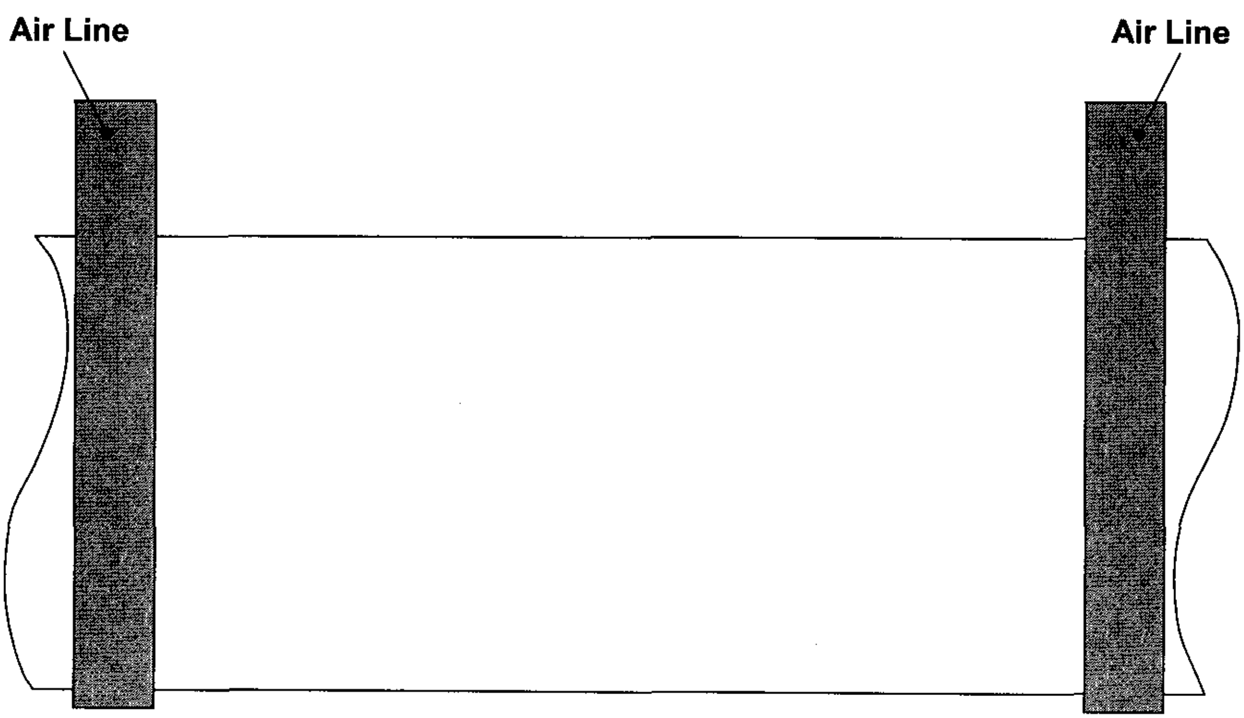
EXAMINER	ANALYST	REVIEWER	PAGE
____________________	____________________	____________________	
LEVEL _____ DATE ________	LEVEL _____ DATE ________	LEVEL _____ DATE ________	OF ___

ATTACHMENT 4: KNUCKLE SKETCH SHEET

Tank ___________

Riser #_____





Knuckle Front Flat View

ATTACHMENT 3

COGEMA "AUTOMATED ULTRASONIC THICKNESS DATA REPORT SHEETS"

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ATTACHMENT 3

COGEMA "AUTOMATED ULTRASONIC THICKNESS DATA REPORT SHEETS"

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

Riser #90

LOCATION: 200EAST TANK Farm | SYSTEM: PSP-4 | EXAM START: 5/20/03 0735 | EXAM END: 1400 | JOB #: 03-41

COMPONENT ID: 102-AZ | EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED | NOM. THICKNESS: .375"

CONFIGURATION: Plate TO | CALIBRATED RANGE: .3" To 1.0" | TEMP: °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 34.7" | REF. LEVEL CORRECTION (TRANS. CORR): Ø DB

PROCEDURE: COGEMA-SVUT-INS-007.3 | REV: 1 | MATERIAL TYPE: ☐ SS ☒ CS OTHER ____ | CONDITION

FILE NAME/ITEM#: Vert. Wall\Plate 1 | TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0): 2" below Horz weld | Y_0 REF. POINT (W_0): ℄ of 24" Riser | SCAN WIDTH: 15"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.389"	.374"		.395"
12-24					.388"	.338"		.345"
24-34.7					.388"	.345"		.393"
SUMMARY								

REMARKS

Examiner: W D Purdy | Level II | Date 5/20/03

Analyst: [signature] | Level III | Date 8/1/03

Reviewer: (NI) | Level ___ | Date ___

Page ___ of ___

P-Scan Limited.

(NI) See Attached Letter From J. B Elder

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 6/11/03 0710	EXAM END: 2050	JOB #: 03-41	
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS: .500"	
CONFIGURATION: PLATE TO		CALIBRATED RANGE: .3" TO 1.0"		TEMP: AMB °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 114.2"		REF. LEVEL CORRECTION (TRANS. CORR): 0 DB			
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____		CONDITION	
FILE NAME/ITEM#: VERT. WALL) PLATE 2		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____			
X_0 REF. POINT (L_0): 1" below Horz weld	Y_0 REF. POINT (W_0): ℄ of 24" Riser	SCAN WIDTH: 1.5"			

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.490"	.456"		.500"
12-24					.490"	.485"		.500"
24-36					.496"	.483"		.500"
36-48					.500"	.493"		.505"
48-60					.502"	.492"		.505"
60-72					.503"	.482"		.505"
72-84					.503"	.498"		.510"
84-96					.502"	.498"		.510"
96-108					.503"	.497"		.510"
108-114.2					.504"	.499"		.510"
SUMMARY								

REMARKS

Examiner: W D Purdy Level II Date 6/11/03 P-Scan Limited	Analyst: WB Nelson Level III Date 8/2/03	Reviewer: (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	6/16/03 0757	1950	03-41

COMPONENT ID	EXAMINATION SURFACE	NOM. THICKNESS
102-AZ	☒ OD ☐ ID ☐ PAINTED	.500"

CONFIGURATION	TO	CALIBRATED RANGE	TEMP
PLATE		.3" TO 1.0"	Amb °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED	REF. LEVEL CORRECTION (TRANS. CORR)
114"	∅ DB

PROCEDURE	REV	MATERIAL TYPE	CONDITION
COGEMA-SVUT-INS-007.3	1	☐ SS ☒ CS OTHER ____	

FILE NAME/ITEM#	TRANSDUCER
VERT. WALL / PLATE 3	☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH
1" below Horz Weld.	℄ of 24" Riser	15"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.499"	.487"		.505"
12-24					.500"	.494"		.505"
24-36					.500"	.497"		.510"
36-48					.503"	.499"		.510"
48-60					.505"	.499"		.510"
60-72					.507"	.501"		.515"
72-84					.508"	.499"		.515"
84-96					.507"	.501"		.515"
96-108					.505"	.499"		.515"
108-114					.508"	.499"		.515"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy Level II Date 6/16/03 P-Scan Limited.	W A Nelson Level III Date 7/30/03	(N1) Level ___ Date ______	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	7/7/03 0830	2020	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED

NOM. THICKNESS: .750"

CONFIGURATION: PLATE TO

CALIBRATED RANGE: .3" TO 1.0"

TEMP: Amb. °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 105.9"

REF. LEVEL CORRECTION (TRANS. CORR): Φ DB

PROCEDURE: COGEMA-SVUT-INS-007.3 REV 1

MATERIAL TYPE: ☐ SS ☒ CS OTHER ____

CONDITION

FILE NAME/ITEM#: VERT. WALL / PLATE 4

TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0): 1" below Horz Weld

Y_0 REF. POINT (W_0): 4 of 24" Riser

SCAN WIDTH: 15"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.775"	.759"		.785"
12-24					.770"	.763"		.785"
24-36					.770"	.763"		.780"
36-48					.770"	.762"		.780"
48-60					.775"	.763"		.785"
60-72					.775"	.763"		.785"
72-84					.772"	.761"		.785"
84-96					.770"	.758"		.780"
96-105.9					.770"	.752"		.780"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W. Brady	W.H. Nelson	(N1)	
Level II Date 7/7/03	Level III Date 7/30/03	Level ___ Date ___	___ of ___
P-Scan Limited.			

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

Riser 90.

LOCATION	200 EAST TANK FARM
SYSTEM	PSP-4
EXAM START	6/11/03 0710
EXAM END	2050
JOB #	03-41
COMPONENT ID	102-A2
EXAMINATION SURFACE	☒ OD ☐ ID ☐ PAINTED
NOM. THICKNESS	.875"
CONFIGURATION	PLATE
TO	
CALIBRATED RANGE	.3" TO 1.0"
TEMP	AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED	21"
REF. LEVEL CORRECTION (TRANS. CORR)	8 DB
PROCEDURE	COGEMA-SVUT-INS-007.3
REV	1
MATERIAL TYPE	☐ SS ☒ CS OTHER
CONDITION	
FILE NAME/ITEM#	VERT. WALL/PLATE 5
TRANSDUCER	☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE
X_0 REF. POINT (L_0)	1" below Horz Weld.
Y_0 REF. POINT (W_0)	℄ of 24" Riser
SCAN WIDTH	15"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.905"	.880"		.915"
12-21					.905"	.878"		.915"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy	Wesley H Nelson	(N1)	
Level II Date 6/11/03	Level NA Date 8/5/03	Level ___ Date ___	___ of ___

P-Scan Limited.

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #: 90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4		EXAM START 5/20/03 0735	EXAM END 1405	JOB # 03-41
COMPONENT ID 102-AZ			EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO			CALIBRATED RANGE 0" TO 1.060"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 34.6"			REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SYUT-INS-007.3	REV 1		MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .375"		
FILE NAME/ITEM# VERT. WALL / PLATE 1			TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 2" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF 24" RISER		SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 5/20/03	Analyst Wesley H Nelson Level III Date 7/15/03	Reviewer (N1) Level ___ Date ___	Page ___ of ___

P-SCAN LIMITED

(N1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/11/03 0720	EXAM END 2100	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO		CALIBRATED RANGE 0" TO 1.414"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 114.1"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SWUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER Nom. Thk .500"		
FILE NAME/ITEM# Vert. Wall / Plate 2		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45		
X_0 REF. POINT (L_0) 1" below Horz Weld	Y_0 REF. POINT (W_0) ℄ of 24" Riser	SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 6/11/03	Analyst Wesley H Nelson Level III Date 7/15/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

P-Scan Limited

(W1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/16/03 0805	EXAM END 1955	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO		CALIBRATED RANGE 0" TO 1.414"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 114"		REF. LEVEL CORRECTION (TRANS. CORR) Φ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .500"		
FILE NAME/ITEM# VERT. WALL / PLATE 3		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF 24" RISER	SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS
NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 6/16/03 P-Scan Limited.	Analyst Wesley D. Nelson Level III Date 8/9/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

(W1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 7/7/03 0830	EXAM END 2033	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO		CALIBRATED RANGE 0" TO 2.12"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 107.4"		REF. LEVEL CORRECTION (TRANS. CORR) ∅ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .750"		
FILE NAME/ITEM# VERT. WALL / PLATE 4		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X0 REF. POINT (L0) 1" BELOW HORZ. WELD	Y0 REF. POINT (W0) ℄ OF 24" RISER	SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W. D. Purdy Level II Date 7/7/03	Analyst Wesley D. Nelson Level ~~III~~ Date 8/9/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

P-Scan Limited

(W1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/11/03 0720	EXAM END 2100	JOB # 03-41
COMPONENT ID 102-A7		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO		CALIBRATED RANGE 0" TO 2.5"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 20.9"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SYUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .875"		
FILE NAME/ITEM# Vert. Wall Plate 5		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF 24" RISER	SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
Level II Date 6/11/03	Level III Date 6/9/03	(W1) Level ___ Date ___	___ of ___

PScan Limited

(W1) See Attached Letter From J. B. Elder

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

Riser # 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200EAST TANK Farm	PSP-4	5/20/03 0735	1400	03-41

COMPONENT ID: 102-AZ
EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED
NOM. THICKNESS: .375"

CONFIGURATION: Plate TO
CALIBRATED RANGE: .3" TO 1.0"
TEMP: Amb °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 34.7"
REF. LEVEL CORRECTION (TRANS. CORR): ∅ DB

PROCEDURE: COGEMA-SVUT-INS-007.3
REV: 1
MATERIAL TYPE: ☐ SS ☒ CS OTHER
CONDITION:

FILE NAME/ITEM#: Vert. Wall\2nd\Plate\
TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE

X_0 REF. POINT (L_0): 2" below Horz Weld.
Y_0 REF. POINT (W_0): 17" From ℄ of 1st Pass To ℄ 2nd PASS
SCAN WIDTH: 15"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12"					.388"	.369"		.393"
12-24					.391"	.371"		.396"
24-34.7					.391"	.350"		.396"
SUMMARY								

REMARKS

Examiner: W.D. Rundy
Level II Date 5/20/03
P-Scan Limited.

Analyst: [signature]
Level III Date 8/1/03

Reviewer (NI)
Level ___ Date ___

Page ___ of ___

(NI) See Attached Letter From J. B Elder

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/14/03 1350	EXAM END: 2200 / JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED	NOM. THICKNESS: .500"
CONFIGURATION: PLATE	TO	CALIBRATED RANGE: .3" TO 1.0"	TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 114.2"		REF. LEVEL CORRECTION (TRANS. CORR): 8 DB	
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____	CONDITION
FILE NAME/ITEM#: VERT. WALL / 2ND / PLATE 2		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____	
X_0 REF. POINT (L_0): 1" below Horz Weld	Y_0 REF. POINT (W_0): 17" From ℄ 1ST PASS TO ℄ 2ND PASS	SCAN WIDTH: 15"	

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12	5.91	7.14	7.3	7.7	.495"	.416"	YES	.510"
0-12	5.25	7.30	-6.3	-7.3	.495"	.418"	YES	.510"
12-24	15.06	15.79	6.4	7.2	.500"	.412"	YES	.515"
24-36					.505"	.489"		.515"
36-48					.505"	.498"		.515"
48-60					.505"	.495"		.515"
60-72					.505"	.492"		.515"
72-84					.510"	.498"		.520"
84-96					.507"	.497"		.515"
96-108					.503"	.490"		.515"
108-114.2					.510"	.497"		.520"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy	[signature]	(N1)	
Level II Date 7/14/03	Level III Date 8/2/03	Level ___ Date ___	___ of ___

P-Scan Limited.

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	7/14/03 0735	2100	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED

NOM. THICKNESS: .500"

CONFIGURATION: PLATE TO

CALIBRATED RANGE: .3" TO 1.0"

TEMP: Amb °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 114"

REF. LEVEL CORRECTION (TRANS. CORR): Φ DB

PROCEDURE: COGEMA-SVUT-INS-007.3 REV 1

MATERIAL TYPE: ☐ SS ☒ CS OTHER ____

CONDITION

FILE NAME/ITEM#: VERT. Wall / 2ND / PLATE 3

TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0): 1" below Horz Weld.

Y_0 REF. POINT (W_0): 17" ℄ of 1ST PASS TO ℄ of 2nd PASS

SCAN WIDTH: 15"

PART #/ INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.510"	.504"		.515"
12-24					.511"	.506"		.515"
24-36					.515"	.507"		.520"
36-48					.514"	.508"		.520"
48-60					.517"	.511"		.520"
60-72					.518"	.511"		.520"
72-84					.518"	.511"		.520"
84-96					.516"	.511"		.520"
96-108					.514"	.508"		.520"
108-114					.517"	.509"		.520"
SUMMARY								

REMARKS:

Examiner	Analyst	Reviewer	Page
[signature] Level II Date 7/16/03 Y-Scan Limited.	W H Nelson Level IIA Date 7/30/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 7/9/03 0717	EXAM END 2040	JOB # 03-41	
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS .750"	
CONFIGURATION PLATE	TO	CALIBRATED RANGE .3" TO 1.0"		TEMP Amb. °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 105.3"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB			
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER ____		CONDITION	
FILE NAME/ITEM# VERT. WALL / 2ND / PLATE 4		TRANSDUCER ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____			
X_0 REF. POINT (L_0) 1" below Horz Weld	Y_0 REF. POINT (W_0) 17" ℄ of 1ST PASS TO ℄ of 2ND PASS	SCAN WIDTH 15"			

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.775"	.763"		.790"
12-24					.770"	.764"		.785"
24-36					.770"	.763"		.785"
36-48					.772"	.763"		.785"
48-60					.773"	.759"		.785"
60-72					.771"	.756"		.785"
72-84					.770"	.763"		.785"
84-96					.770"	.759"		.785"
96-105.3					.775"	.759"		.790"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy Level II Date 7/9/03	W H Nelson Level III Date 7/30/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 9D

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	7/9/03 0717	2040	03-41

COMPONENT ID	EXAMINATION SURFACE	NOM. THICKNESS
102-AZ	☒ OD ☐ ID ☐ PAINTED	.875"

CONFIGURATION	TO	CALIBRATED RANGE	TEMP
PLATE		.3" TO 1.0"	AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED	REF. LEVEL CORRECTION (TRANS. CORR)
22.5"	0 DB

PROCEDURE	REV	MATERIAL TYPE	CONDITION
COGEMA-SVUT-INS-007.3	1	☐ SS ☒ CS OTHER ______	

FILE NAME/ITEM#	TRANSDUCER
VERT. WALL 2ND PLATE 5	☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH
1" below HORZ weld	17" CL of 1ST PASS TO CL of 2ND PASS	15"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.910"	.885"		.920"
12-22.5					.905"	.874"		.915"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy Level II Date 7/9/03 P-Scan Limited.	Wesley H Nelson Level VR Date 8/5/03	N1 Level ____ Date ______	____ of ____

N1 SEE ATTACHED LETTER FROM J. B. ELDER

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser # 90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 5/20/03 0740	EXAM END 1405	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO		CALIBRATED RANGE 0" TO 1.06"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 34.6"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER Nom. THk .375"		
FILE NAME/ITEM# Vert. Wall/2nd/Plate 1		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45		
X0 REF. POINT (L0) 2" below HORZ Weld	Y0 REF. POINT (W0) 17" ℄ of 1st PASS TO ℄ of 2nd PASS	SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 5/20/03	Analyst [signature] Level IIa Date 7/15/03	Reviewer (WI) Level ___ Date ___	Page ___ of ___

P-Scan Limited.

(WI) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 7/14/03 1346	EXAM END 2205	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO		CALIBRATED RANGE 0" TO 1.414"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 114.2"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .500"		
FILE NAME/ITEM# VERT. WALL/2ND/PLATE 2		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) 17" ℄ OF 1ST PASS TO ℄ OF 2ND PASS	SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W B Purdy Level II Date 7/14/03 P-Scan Limited	Analyst Wesley H Nelson Level III Date 7/15/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

(W1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/16/03 0745	EXAM END: 2105	JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION: Plate TO		CALIBRATED RANGE: 0" TO 1.414"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 113.3"		REF. LEVEL CORRECTION (TRANS. CORR): 8 DB		
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER NOM. THK. .500"		
FILE NAME/ITEM#: Vert. Wall/2nd/Plate 3		TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0): 1" below Horz weld	Y_0 REF. POINT (W_0): 17" ℄ of 1st PASS To ℄ of 2nd PASS	SCAN WIDTH: 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner: W D Purdy Level II Date 7/16/03 P-Scan Limited.	Analyst: [signature] Level III Date 8/14/03	Reviewer: (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

ULTRASONIC P-SCAN DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/9/03 0725	EXAM END: 2045	JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION: PLATE	TO	CALIBRATED RANGE: 0" TO 2.12"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 105.4"		REF. LEVEL CORRECTION (TRANS. CORR): 8 DB		
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER NOM. THK. .750"		
FILE NAME/ITEM#: Vert. Wall/2nd Plate 4		TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
Xo REF. POINT (Lo): 1" below HORZ Weld	Yo REF. POINT (Wo): 17" ℄ of 1ST PASS To ℄ of 2nd PASS	SCAN WIDTH: 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner: W D Purdy Level II Date 7/9/03 P-Scan Limited.	Analyst: Wesley H. [signature] Level III Date 8/14/03	Reviewer: (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

ULTRASONIC P-SCAN DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/9/03 0725	EXAM END: 2045	JOB #: 03-41	
COMPONENT ID: 102 - AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		CONDITION	
CONFIGURATION: Plate TO		CALIBRATED RANGE: 0" TO 2.5"		TEMP: AMB °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 23.9"		REF. LEVEL CORRECTION (TRANS. CORR): 0 DB			
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER NOM. THK. .875"			
FILE NAME/ITEM#: Vert. Wall/2nd/Plate 5		TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°			
Xo REF. POINT (Lo): 1" below HORZ weld	Yo REF. POINT (Wo): 17" ℄ of 1st PASS TO ℄ of 2nd PASS	SCAN WIDTH: 15"			

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
W D Purdy Level II Date 7/9/03 P-Scan Limited	Wesley D Nelson Level ~~III~~ Date 8/14/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/16/03 0735	EXAM END: 2100 / JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED	NOM. THICKNESS: .500"
CONFIGURATION: PLATE	TO	CALIBRATED RANGE: .3" TO 1.0"	TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 10.2"		REF. LEVEL CORRECTION (TRANS. CORR): 0 DB	
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____	CONDITION
FILE NAME/ITEM#: VERT. WALL / 3RD / PLATE 2		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____	
X_0 REF. POINT (L_0): 1" below HORZ Weld	Y_0 REF. POINT (W_0): 7" ℄ of 2ND PASS TO ℄ of 3RD PASS	SCAN WIDTH: 15"	

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-10.2	.394	1.64	.887	2.02	.495"	.411"	YES	.510"
0-10.2	6.56	8.14	.169	-.972	.495"	.414"	YES	.510"
0-10.2	6.24	6.95	-4.14	-5.02	.495"	.434"	YES	.510"
SUMMARY								

REMARKS:

Examiner	Analyst	Reviewer	Page
[signature] Level II Date 7/16/03	[signature] Level III Date 8/2/03	N1 Level ___ Date ___	___ of ___

P-Scan Limited

N1 SEE ATTACHED LETTER FROM J.B. ELDER

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser 90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 7/16/03 0745	EXAM END 2105	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO		CALIBRATED RANGE 0" TO 1.414"		TEMP AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 10.2"		REF. LEVEL CORRECTION (TRANS. CORR) 0 DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER THK. .500"		
FILE NAME/ITEM# Vert. Wall 3rd Plate 2		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 1" below Horz Weld	Y_0 REF. POINT (W_0) 17" 4 of 2nd Pass To % of 3rd Pass	SCAN WIDTH 15"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

No Crack Like Indications.

Examiner	Analyst	Reviewer	Page
W D Rudy Level II Date 7/16/03 P-Scan Limited	Wesley D Nelson Level III Date 7/16/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	7/17/03 0725	1449	03-41

COMPONENT ID	EXAMINATION SURFACE	NOM. THICKNESS
102-AZ	☒ OD ☐ ID ☐ PAINTED	.875"

CONFIGURATION	TO	CALIBRATED RANGE	TEMP
KNUCKLE		.3" To 1.0"	AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED	REF. LEVEL CORRECTION (TRANS. CORR)
68.4"	8 DB

PROCEDURE	REV	MATERIAL TYPE	CONDITION
COGEMA-SVUT-INS-007.3	1	☐ SS ☒ CS OTHER ____	

FILE NAME/ITEM#	TRANSDUCER
Y-ARM / KNUCKLE	☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH
2nd Vert Weld EAST of 24" Riser	℄ of HORZ Weld	12"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.870"	.843"		.885"
12-24					.875"	.842"		.885"
24-36					.882"	.854"		.890"
36-48					.885"	.854"		.890"
48-60					.885"	.852"		.900"
60-68.4					.890"	.848"		.900"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy Level II Date 7/17/03 P-SCAN LIMITED	Wesley D Nelson Level III Date 8/1/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	7/21/03 0750	2303	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED

NOM. THICKNESS:

CONFIGURATION: KNUCKLE TO

CALIBRATED RANGE: .3" TO 1.0"

TEMP: AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 68"

REF. LEVEL CORRECTION (TRANS. CORR): 8 DB

PROCEDURE: COGEMA-SVUT-INS-007.3 REV: 1

MATERIAL TYPE: ☐ SS ☒ CS OTHER ____

CONDITION:

FILE NAME/ITEM#: Y-ARM / KNUCKLE/A

TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0): 1st Vert weld EAST of 24" Riser

Y_0 REF. POINT (W_0): ℄ of Horz weld.

SCAN WIDTH: 12.9"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.895"	.868"		.910"
12-24					.895"	.865"		.910"
24-36					.895"	.865"		.910"
36-48					.895"	.853"		.910"
48-60					.890"	.858"		.910"
60-68					.890"	.856"		.910"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy	WA Nelson	(N1)	
Level II Date 7/21/03	Level III Date 8/1/03	Level ___ Date ___	___ of ___

P-SCAN LIMITED

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	9/21/03 0750	2303	03-41

COMPONENT ID: 102-AZ
EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED
NOM. THICKNESS:

CONFIGURATION: KNUCKLE TO
CALIBRATED RANGE: .290 1.10"
TEMP: AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 120"
REF. LEVEL CORRECTION (TRANS. CORR): 0 DB

PROCEDURE: COGEMA-SVUT-INS-007.3 REV 1
MATERIAL TYPE: ☐ SS ☒ CS OTHER
CONDITION:

FILE NAME/ITEM#: Y-ARM / KNUCKLE / B
TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE

X_0 REF. POINT (L_0): 1st Vert weld East of 24" Riser
Y_0 REF. POINT (W_0): ℄ of Horz Weld.
SCAN WIDTH: 11.5"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX THK.
0-12					.880"	.843"		.910"
12-24					.875"	.846"		.900"
24-36					.880"	.849"		.900"
36-48					.880"	.850"		.900"
48-60					.880"	.852"		.900"
60-72					.880"	.846"		.900"
72-84					.890"	.842"		.900"
84-96					.890"	.856"		.900"
96-108					.890"	.866"		.900"
108-120					.885"	.856"		.905"
SUMMARY								

REMARKS

Started @ End of File Knuckle A

Examiner	Analyst	Reviewer	Page
W. D. Purdy Level VI Date 9/21/03 PSCAN LIMITED	Wesley A. Nelson Level III Date 8/1/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

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ULTRASONIC P-SCAN DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/23/03 0835	EXAM END: 2230	JOB #: 03-41	
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		CONDITION	
CONFIGURATION: KNUCKLE	TO	CALIBRATED RANGE: 0" TO 2.5"		TEMP: AMB °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 65.7"		REF. LEVEL CORRECTION (TRANS. CORR): 8 DB			
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER NOM. THK. .875"			
FILE NAME/ITEM#: Y-ARM/45/KNUCKLE		TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°			
X_0 REF. POINT (L_0): 2ND VERT. WELD EAST OF 24" RISER.	Y_0 REF. POINT (W_0): ℄ OF HORZ. WELD	SCAN WIDTH: 12.6"			

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS
NO CRACK LIKE INDICATIONS

Examiner: W D Purdy Level II Date 7/28/03 P-SCAN LIMITED	Analyst: [signature] Level [illegible] Date 8/10/03	Reviewer (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

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ULTRASONIC P-SCAN DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	7/23/03 0835	2230	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED

CONDITION:

CONFIGURATION: KNUCKLE TO

CALIBRATED RANGE: 0" TO 2.5"

TEMP: AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 12.8"

REF. LEVEL CORRECTION (TRANS. CORR): 0 DB

PROCEDURE: COGEMA-SVUT-ENS-007.3 REV 1

MATERIAL TYPE: ☐ SS ☒ CS OTHER NOM. THK. .875"

FILE NAME/ITEM#: Y-ARM/45/KNUCKLE A

TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°

X_0 REF. POINT (L_0): STARTED @ 63.1" OF KNUCKLE

Y_0 REF. POINT (W_0): ℄ OF HORZ. WELD

SCAN WIDTH: 12.6"

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
W. D. Purdy Level II Date 7/23/03 P-SCAN LIMITED	[signature] Level III Date 8/10/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

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ULTRASONIC P-SCAN DATA REPORT

RISER 9D

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/23/03 0835	EXAM END: 2230	JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION: KNUCKLE TO		CALIBRATED RANGE: 0" TO 2.5"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 120"		REF. LEVEL CORRECTION (TRANS. CORR): 8 DB		
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER NOM. THK. .875"		
FILE NAME/ITEM#: Y-ARM/45/KNUCKLE B		TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0): STARTED @ 10:12 OF KNUCKLE A	Y_0 REF. POINT (W_0): ℄ OF HORZ. WELD	SCAN WIDTH: 12.6"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner: W D Purdy Level II Date 7/23/03 P-SCAN LEMSTED	Analyst: Wesley A Nell Level ~~III~~ Date 8/10/03	Reviewer: (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

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ULTRASONIC P-SCAN DATA REPORT

RISER 90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 7/24/03 0816	EXAM END 1415	JOB # 03-41	
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION	
CONFIGURATION KNUCKLE TO		CALIBRATED RANGE 0" TO 2.5"		TEMP AMB °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 67.7"		REF. LEVEL CORRECTION (TRANS. CORR) 8 DB			
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .875"			
FILE NAME/ITEM# Y-ARM/45/KNUCKLE C		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°			
X_0 REF. POINT (L_0) STARTING @ 2ND VERT. WELD, EAST 24"	Y_0 REF. POINT (W_0) ℄ OF HORZ. WELD	SCAN WIDTH 12.6"			

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 7/24/03 P-SCAN LIMITED	Analyst [signature] Level III Date 8/10/03	Reviewer (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	8/5/03 0810	1440	03-41

COMPONENT ID	EXAMINATION SURFACE	NOM. THICKNESS
102-AZ	☒ OD ☐ ID ☐ PAINTED	

CONFIGURATION TO	CALIBRATED RANGE	TEMP °F
KNUCKLE SLOT	.3" TO 1.0"	AMB

CIRCUMFERENCE/TOTAL LENGTH EXAMINED	REF. LEVEL CORRECTION (TRANS. CORR)
.79"	8 DB

PROCEDURE	REV	MATERIAL TYPE	CONDITION
COGEMA-SVUT-INS-007.3	1	☐ SS ☒ CS OTHER ______	

FILE NAME/ITEM#	TRANSDUCER
Y-ARM| SLOT 1-1	☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH
EDGE OF SLOT	APPROX. END OF Y-ARM/KNUCKLE SCAN	8.3"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0 - .79					.890"	.864"		.905"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
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N1 SEE ATTACHED LETTER FROM J. B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	8/5/03 0810	1440	03-4641

COMPONENT ID	EXAMINATION SURFACE	NOM. THICKNESS
102-AZ	☒ OD ☐ ID ☐ PAINTED	

CONFIGURATION	TO	CALIBRATED RANGE	TEMP
KNUCKLE	SLOT	.3" TO 1.0"	AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED	REF. LEVEL CORRECTION (TRANS. CORR)
.77"	0 DB

PROCEDURE	REV	MATERIAL TYPE	CONDITION
COGEMA -SVUT-INS-007.3	1	☐ SS ☒ CS OTHER ___	

FILE NAME/ITEM#	TRANSDUCER
Y-ARM / SLOT 2-1	☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ___

X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH
EDGE OF SLOT	APPROX. END OF Y-ARM KNUCKLE SCAN	5.3"

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0 - .77					.880"	.858"		.895"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
Wesley D Nelson	Wesley D Nelson	(N1)	
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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 8/5/03 0810	EXAM END: 1446	JOB #: 03-41	
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS:	
CONFIGURATION: KNUCKLE TO SLOT		CALIBRATED RANGE: .3" TO 1.0"		TEMP: AMB °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: .57"		REF. LEVEL CORRECTION (TRANS. CORR): 0 DB			
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____		CONDITION:	
FILE NAME/ITEM#: Y-ARM / SLOT A1		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____			
X_0 REF. POINT (L_0): EDGE of SLOT	Y_0 REF. POINT (W_0): APPROX. END OF Y-ARM / KNUCKLE SCAN	SCAN WIDTH: 7.6"			

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0 - .57					.898"	.858"		.910"
SUMMARY								

REMARKS

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(N1) SEE ATTACHED LETTER FROM J. B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4		EXAM START: 8/5/03 0810	EXAM END: 1440	JOB #: 03-41
COMPONENT ID: 102-A2			EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS:
CONFIGURATION: KNUCKLE TO SLOT			CALIBRATED RANGE: .3" TO 1.0"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: .59"			REF. LEVEL CORRECTION (TRANS. CORR): 0 DB		
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1		MATERIAL TYPE: ☐ SS ☒ CS OTHER ____		CONDITION:
FILE NAME/ITEM#: Y-ARM / SLOT B2			TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____		
X_0 REF. POINT (L_0): EDGE OF SLOT	Y_0 REF. POINT (W_0): APPROX. 40 ND OF Y-ARM/KNUCKLE SCAN		SCAN WIDTH: 7.8"		

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0-.59					.885"	.866"		.910"
SUMMARY								

REMARKS

Examiner: Wesley A. Nel[?] Level II Date 8/5/03	Analyst: Wesley A. Nel[?] Level II Date 8/5/03	Reviewer: (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90.

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 5/22/03 0735	EXAM END: 1435	JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS: .375"
CONFIGURATION: PLATE TO PLATE		CALIBRATED RANGE: .3" TO 1.0"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 30.8		REF. LEVEL CORRECTION (TRANS. CORR): & DB		
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____		CONDITION
FILE NAME/ITEM#: VERT. WELD / PLATE 1		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____		
X_0 REF. POINT (L_0): 3" below Horz Weld.	Y_0 REF. POINT (W_0): ℄ of Vert Weld	SCAN WIDTH: 10.6"		

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0 - 12	9.33"	9.38"	-4.01"	-4.08"	.380"	.334"	YES	.395"
12 - 24	14.26"	14.58"	-5.20"	-5.89"	.380"	.312"	YES	.395"
24 - 30.8	26.65"	26.70"	.976"	1.08"	.380"	.333"	YES	.395"
SUMMARY								

REMARKS

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W D Purdy Level II Date 5/22/03 P-Scan Limited.	W H Nelson Level III Date 7/31/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	5/22/03 0735	1435	03-41

COMPONENT ID: 102-AZ	EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED	NOM. THICKNESS: .500"
CONFIGURATION: PLATE TO PLATE	CALIBRATED RANGE: .3" TO 1.0"	TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 115.7"	REF. LEVEL CORRECTION (TRANS. CORR): Ø DB	
PROCEDURE: COGEMA-SVUT-INS-007.3 REV 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER ____	CONDITION
FILE NAME/ITEM#: VERT. WELD / PLATE 2	TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____	
X_0 REF. POINT (L_0): 1" below Horz weld. Y_0 REF. POINT (W_0): ℄ of Vert. Weld	SCAN WIDTH: 10.4"	

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.495"	.479"		.505"
12-24					.495"	.481"		.505"
24-36					.500"	.473"		.510"
36-48					.500"	.487"		.510"
48-60					.500"	.476"		.510"
60-72					.500"	.486"		.510"
72-84					.505"	.484"		.515"
84-96					.505"	.496"		.515"
96-108					.505"	.489"		.515"
108-115.7					.505"	.499"		.515"
SUMMARY								

REMARKS

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P-Scan Limited.

(N1) SEE ATTACHED LETTER FROM J.B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/4/03 0745	EXAM END 1415	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS .500"
CONFIGURATION PLATE TO PLATE		CALIBRATED RANGE .3" TO 1.0"		TEMP AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 113.4"		REF. LEVEL CORRECTION (TRANS. CORR) Ø DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER ____		CONDITION
FILE NAME/ITEM# VERT. WELD / PLATE 3		TRANSDUCER ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____		
X_0 REF. POINT (L_0) 1" below Horz Weld.	Y_0 REF. POINT (W_0) ℄ of Vert weld.	SCAN WIDTH 10.9"		

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.500"	.482"		.510"
12-24					.500"	.474"		.510"
24-36					.500"	.482"		.510"
36-48					.505"	.479"		.510"
48-60					.505"	.479"		.510"
60-72					.505"	.478"		.515"
72-84					.505"	.487"		.515"
84-96					.505"	.497"		.515"
96-108					.505"	.489"		.515"
108-113.4					.505"	.496"		.515"
SUMMARY								

REMARKS

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W D Rudy Level II Date 6/4/03 P-Scan Limited.	W H Nelson Level ~~III~~ Date 7/31/03	N1 Level ___ Date ______	___ of ___

N1 SEE ATTACHED LETTER FROM J. B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	6/10/03 0717	1415	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED

NOM. THICKNESS: .750"

CONFIGURATION: PLATE TO PLATE

CALIBRATED RANGE: .3" TO 1.0"

TEMP: AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 103"

REF. LEVEL CORRECTION (TRANS. CORR): 0 DB

PROCEDURE: COGEMA-SVUT-SNS-007.3 REV 1

MATERIAL TYPE: ☐ SS ☒ CS OTHER ____

CONDITION

FILE NAME/ITEM#: VERT. WELD/PLATE 4

TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X_0 REF. POINT (L_0): 1" below HORZ Weld

Y_0 REF. POINT (W_0): CL of Vert Weld

SCAN WIDTH: 10.5"

PART #/ INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.760"	.740"		.775"
12-24					.760"	.748"		.770"
24-36					.760"	.752"		.770"
36-48					.760"	.748"		.770"
48-60					.760"	.749"		.770"
60-72					.758"	.749"		.770"
72-84					.759"	.752"		.770"
84-96					.758"	.739"		.770"
96-103.					.760"	.744"		.770"
SUMMARY								

REMARKS

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W D Purdy Level II Date 6/10/03 P-Scan Limited.	[signature] Level IIA Date 7/31/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

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AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90.

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 5/21/03 0810	EXAM END 1000	JOB # 03-41	
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS .875"	
CONFIGURATION PLATE TO PLATE		CALIBRATED RANGE .3" TO 1.0"		TEMP AMB °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 21.4"		REF. LEVEL CORRECTION (TRANS. CORR) 8 DB			
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER		CONDITION	
FILE NAME/ITEM# VERT. WELD / PLATE 5		TRANSDUCER ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE			
X_0 REF. POINT (L_0) 1" below Horz Weld.	Y_0 REF. POINT (W_0) ℄ of Vert Weld	SCAN WIDTH 10.6"			

PART #/ INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.905"	.891"		.920"
12-21.4					.905"	.850"		.920"
SUMMARY								

REMARKS

Examiner W D Purdy Level II Date 5/21/03 P-Scan Limited.	Analyst [signature] Level III Date 7/31/03	Reviewer (N1) Level ___ Date ___	Page ___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 5/22/03 0740	EXAM END 1445	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" TO 1.5"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 29"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .375"		
FILE NAME/ITEM# VERT. WELD / PLATE 1		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°		
X_0 REF. POINT (L_0) 3" BELOW HORZ. WELD / DUE TO DOME	Y_0 REF. POINT (W_0) ℄ OF VERT WELD	SCAN WIDTH 10.7"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D [signature] Level III Date 5/22/03	Analyst [signature] Level III Date 8/7/03	Reviewer (WI) Level ___ Date ___	Page ___ of ___

P-Scan Limited.

(WI) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	5/22/03 0740	1445	03-41

COMPONENT ID: 102-AZ	EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED
CONDITION:	
CONFIGURATION: Plate TO PLATE	CALIBRATED RANGE: 0" TO 2"
TEMP: Amb °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 1113.4"	REF. LEVEL CORRECTION (TRANS. CORR): ϕ DB
PROCEDURE: COGEMA-SWUT-INS-007.3 REV 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER NOM THK. .500"
FILE NAME/ITEM#: VERT. WELD / PLATE 2	TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°
X_0 REF. POINT (L_0): 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0): ℄ OF VERT. WELD
SCAN WIDTH: 10.4"	

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
W D Purdy	Wayland D Nel	(N1)	
Level II Date 5/22/03	Level VI Date 8/7/03	Level ___ Date ___	___ of ___
P-Scan Limited			

(N1) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/4/03 0755	EXAM END 1425	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" TO 2.0"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 111.2"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SIUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER Nom. THK. .540"		
FILE NAME/ITEM# VERT WELD/ PLATE 3		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°		
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF VERT. WELD	SCAN WIDTH 10.8"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 6/4/03 P-Scan Limited.	Analyst Wesley A [illegible] Level III Date 8/7/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

(W1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/10/03 0730	EXAM END 1420	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" TO 3.0"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 101.2		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SWUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .750"		
FILE NAME/ITEM# VERT. WELD / PLATE 4		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°		
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF VERT. WELD	SCAN WIDTH 10.2"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS
NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 6/10/03 P-Scan Limited	Analyst [signature] Level III Date 8/7/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

(W1) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	5/21/03 0825	1010	03-41

COMPONENT ID	EXAMINATION SURFACE	CONDITION
102-AZ	☒ OD ☐ ID ☐ PAINTED	

CONFIGURATION	CALIBRATED RANGE	TEMP
Plate TO PLATE	0" TO 3.85"	Amb °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED	REF. LEVEL CORRECTION (TRANS. CORR)
18.9"	Ø DB

PROCEDURE	REV	MATERIAL TYPE
COGEMA-SWUT-INS-007.3	1	☐ SS ☒ CS OTHER NOM. THK. .875"

FILE NAME/ITEM#	TRANSDUCER
VERT. WELD / PLATE 5	☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°

X_0 REF. POINT (L_0)	Y_0 REF. POINT (W_0)	SCAN WIDTH
1" BELOW HORZ. WELD	℄ OF VERT. WELD	10.3"

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
W D Purdy Level II Date 5/21/03 P-Scan Limited	Wesley H Nelson Level III Date 8/7/03	(N1) Level ___ Date ___	___ of ___

(N1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/26/03 0810	EXAM END 1500	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" TO 1.1"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 31"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SIUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .375"		
FILE NAME/ITEM# VERT. WELD / 45 / PLATE 1		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 3" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF VERT. WELD	SCAN WIDTH 8.0"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner [signature] Level III Date 6/26/03	Analyst [signature] Level III Date 8/7/03	Reviewer (WI) Level ___ Date ___	Page ___ of ___

(WI) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/12/03 0720	EXAM END 1455	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" to 1.414"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 33.5" & 84"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SWUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER Nom. THK. .500"		
FILE NAME/ITEM# VERT. WELD 45 PLATE 2 & 2A		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF VERT. WELD	SCAN WIDTH 7.5"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

2A STARTED @ 31.5" OF 2

Examiner	Analyst	Reviewer	Page
[signature] Level WI Date 6/12/03	[signature] Level WI Date 8/7/03	WI Level ___ Date ___	___ of ___

WI See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/30/03 1230	EXAM END 2010	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" TO 1.414"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 86" & 31.4"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .500"		
FILE NAME/ITEM# VERT. WELD/45/PLATE 3&3A		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF VERT. WELD	SCAN WIDTH 8.1"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

3A STARTED @ 84" OF 3

Examiner	Analyst	Reviewer	Page
Wesley H. Nelson Level III Date 6/30/03	Wesley H. Nelson Level III Date 8/7/03	(W1) Level ___ Date ___	___ of ___

(W1) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/30/03 1230	EXAM END 2010	JOB # 03-41	
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION	
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" TO 2.2"		TEMP Amb °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 104.8"		REF. LEVEL CORRECTION (TRANS. CORR) ø DB			
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .750"			
FILE NAME/ITEM# VERT. WELD/45/ PLATE 4		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°			
X_0 REF. POINT (L_0) 1" BELOW HORZ. WELD	Y_0 REF. POINT (W_0) ℄ OF VERT. WELD	SCAN WIDTH 7.8"			

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
[signature] Level III Date 6/30/03	[signature] Level III Date 8/7/03	(W1) Level ___ Date ___	___ of ___

(W1) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/30/03 1230	EXAM END 2010	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO PLATE		CALIBRATED RANGE 0" TO 2.5"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 22.8"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .875"		
FILE NAME/ITEM# VERT. WELD/45/PLATE 5		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X₀ REF. POINT (L₀) 1" BELOW HORZ. WELD	Y₀ REF. POINT (W₀) ℄ OF WELD	SCAN WIDTH 7.7"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
ϕ 1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner [signature] Level III Date 6/30/03	Analyst [signature] Level III Date 9/7/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

(W1) See Attached Letter From J. B. Elder

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 5/29/03 0755	EXAM END: 1445	JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS: .875"
CONFIGURATION: PLATE TO KNUCKLE		CALIBRATED RANGE: .3" TO 1.0"		TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 106.4"		REF. LEVEL CORRECTION (TRANS. CORR): 0 DB		
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER		CONDITION
FILE NAME/ITEM#: HORZ. WELD/KNUCKLE		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE		
X_0 REF. POINT (L_0): 2nd Vert Weld East of 24" Riser	Y_0 REF. POINT (W_0): ℄ of HORZ Weld	SCAN WIDTH: 10.3		

PLATE 1 SIDE 1

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.909"	.889"		.920"
12-24					.910"	.888"		.920"
24-36					.910"	.885"		.920"
36-48					.910"	.887"		.920"
48-60					.915"	.881"		.930"
60-72					.915"	.891"		.930"
72-84					.920"	.864"		.930"
84-96					.907"	.860"		.925"
96-~~104.4~~ 106.4 WDP 5/29/03					.905"	.886"		.915"
SUMMARY								

REMARKS

Examiner: [signature] Level II Date 5/29/03	Analyst: [signature] Level ~~III~~ Date 7/29/03	Reviewer (N1) Level ___ Date ___	Page ___ of ___

Y-Scan Limited.

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 5/29/03 0755	EXAM END: 1445	JOB #: 03-41
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED	NOM. THICKNESS: .875"
CONFIGURATION: PLATE TO KNUCKLE		CALIBRATED RANGE: .3" TO 1.0"	TEMP: AMB °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 106.4"		REF. LEVEL CORRECTION (TRANS. CORR): 0 DB	
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER	CONDITION
FILE NAME/ITEM#: HORZ WELD / KNUCKLE		TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE	
X_0 REF. POINT (L_0): 2nd vert weld East of 24" Riser	Y_0 REF. POINT (W_0): ℄ of Horz Weld	SCAN WIDTH: 10.3	

KNUCKLE SECT

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.875"	.854"		.900"
12-24					.875"	.856"		.900"
24-36					.875"	.851"		.905"
36-48					.882"	.862"		.905"
48-60					.890"	.870"		.920"
60-72					.890"	.856"		.920"
72-84					.890"	.865"		.920"
84-96					.890"	.864"		.920"
96-106.4					.885"	.867"		.915"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy Level II Date 5/29/03 P-Scan Limited.	Wesley A. [signature] Level III Date 7/29/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

Riser # 3, 90
AME 8-14-03

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK Farm	PSP-4	6/3/03 0720	1425	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED

NOM. THICKNESS: .875"

CONFIGURATION: Plate TO Plate

CALIBRATED RANGE: .3" TO 1.0"

TEMP: Amb °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 120"

REF. LEVEL CORRECTION (TRANS. CORR): Ø DB

PROCEDURE: COGEMA-SVUT-INS-007.3 REV 1

MATERIAL TYPE: ☐ SS ☒ CS OTHER ______

CONDITION:

FILE NAME/ITEM#: Horz. Weld/Knuckle A

TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X₀ REF. POINT (L₀): 1st Vert weld EAST of 24" Riser

Y₀ REF. POINT (W₀): ℄ of Horz Weld

SCAN WIDTH: 10.1"

Plate Spot 1

PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.895"	.877"		.905"
12-24					.885"	.842"		.905"
24-36					.885"	.865"		.900"
36-48					.885"	.863		.900"
48-60					.885"	.849"		.900"
60-72					.885"	.852"		.895"
72-84					.885"	.852"		.895"
84-96					.886"	.868"		.895"
96-108					.885"	.863"		.895"
108-120					.885"	.862"		.895"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Purdy	[signature]	(N1)	
Level II Date 6/3/03	Level III Date 7/29/03	Level ___ Date ______	___ of ___
P-Scan Limited			

(N1) See Attached Letter From J.B Elder.

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

RISER 9D

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	6/3/03 0720	1425	03-41

COMPONENT ID: 102-AZ
EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED
NOM. THICKNESS: .875

CONFIGURATION: PLATE TO KNUCKLE
CALIBRATED RANGE: .3" TO 1.0"
TEMP: AMB °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 120"
REF. LEVEL CORRECTION (TRANS. CORR): 0 DB

PROCEDURE: COGEMA-SVUT-INS-007.3
REV: 1
MATERIAL TYPE: ☐ SS ☒ CS OTHER ____
CONDITION:

FILE NAME/ITEM#: HORZ. WELD/KNUCKLE A
TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE ____

X₀ REF. POINT (L₀): 1st Vert Weld EAST of 24" Riser
Y₀ REF. POINT (W₀): ℄ of Horz Weld
SCAN WIDTH: 10.1"

KNUCKLE SIDE

PART #/ INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK, R. LIG.	AREA REPORTABLE	MAX. THK.
0-12					.895"	.872"		.905"
12-24					.890"	.870"		.900"
24-36					.892"	.871"		.900"
36-48					.890"	.869"		.900"
48-60					.885"	.864"		.895"
60-72					.885"	.856"		.895"
72-84					.865"	.837"		.875"
84-96					.865"	.843"		.875"
96-108					.870"	.849"		.880"
108-120					.870"	.842"		.880"
SUMMARY								

REMARKS

Examiner	Analyst	Reviewer	Page
W D Rudy Level II Date 6/3/03 P-Scan Limited.	[signature] Level III Date 7/29/03	(N1) Level ___ Date ___	___ of ___

(N1) SEE ATTACHED LETTER FROM J. B. ELDER

4/00

AUTOMATED ULTRASONIC THICKNESS DATA REPORT

AME 8-14-03

Riser # 3190

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200EAST TANK Farm	PSP-4	6/3/03 0720	1425	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED

NOM. THICKNESS: .875

CONFIGURATION: Plate TO Plate

CALIBRATED RANGE: .3" To 1.0"

TEMP: Amb °F

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 73.7"

REF. LEVEL CORRECTION (TRANS. CORR): Ø DB

PROCEDURE: COGEMA-SVUT-INS-007.3 REV 1

MATERIAL TYPE: ☐ SS ☒ CS OTHER

CONDITION

FILE NAME/ITEM#: HORZ Weld\Knuckle B

TRANSDUCER: ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE

X_0 REF. POINT (L_0): 1st Vert weld West of 24" Riser

Y_0 REF. POINT (W_0): ℄ of HORZ weld.

SCAN WIDTH: 10.2"

	PART # / INDICATION	X START	X STOP	Y START	Y STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	MAX. THK.
PLATE 550X	0-12					.890"	.870"		.900"
	12-24					.895"	.870"		.905"
	24-36					.895"	.871"		.905"
	36-48					.890"	.868"		.900"
	48-60					.894"	.866"		.900"
	60-73.7					.895"	.871"		.905"
KNUCKLE 550X	0-12					.875"	.851"		.885"
	12-24					.880"	.861"		.890"
	24-36					.880"	.872"		.900"
	36-48					.890"	.871"		.900"
	48-60					.885"	.865"		.900"
	60-73.7					.885"	.868"		.900"
	SUMMARY								

REMARKS

Started @ END of File Knuckle A

Examiner	Analyst	Reviewer	Page
WD Purdy	[signature]	(NI)	
Level II Date 6/3/03	Level III Date 7/29/03	Level ___ Date ___	___ of ___

P-Scan Limited.

(NI) See Attached Letter From J.B Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 5/29/03 0805	EXAM END 1455	JOB # 03-41	
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION	
CONFIGURATION Plate TO KNUCKLE		CALIBRATED RANGE 0" TO 3.5"		TEMP Amb °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 103.7"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB			
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .875"			
FILE NAME/ITEM# HORZ. WELD / KNUCKLE		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°			
X_0 REF. POINT (L_0) STARTED @ 242 VERT WELD EAST 24"	Y_0 REF. POINT (W_0) ℄ OF HORZ WELD	SCAN WIDTH 9.9"			

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS
NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
W.D. Purdy	Wesley A. Nel	(W1)	
Level II Date 5/29/03	Level III Date 9/10/03	Level ___ Date ___	___ of ___

P-Scan Limited.

(W1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/3/03 0735	EXAM END 1430	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO KNUCKLE		CALIBRATED RANGE 0" TO 3.5"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 120"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SWT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .875"		
FILE NAME/ITEM# HORZ. WELD/ KNUCKLE A		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°		
X_0 REF. POINT (L_0) STARTED @ 1st VERT WELD, EAST 24"	Y_0 REF. POINT (W_0) ℄ OF HORZ. WELD	SCAN WIDTH 9.8"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D Purdy	Analyst Wesley A Nen	Reviewer (W1)	Page
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P-Scan Limited.

(W1) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4	EXAM START 6/3/03 0735	EXAM END 1430	JOB # 03-41
COMPONENT ID 102-AZ		EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO KNUCKLE		CALIBRATED RANGE 0" TO 3.5"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 71.2"		REF. LEVEL CORRECTION (TRANS. CORR) ϕ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .875"		
FILE NAME/ITEM# HORZ. WELD/KNUCKLE B		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 60°		
X_0 REF. POINT (L_0) STARTED @ END OF B	Y_0 REF. POINT (W_0) ℄ OF HORZ. WELD	SCAN WIDTH 9.8"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner W D Purdy Level II Date 6/3/03 P-Scan Limited.	Analyst [signature] Level III Date 8/10/03	Reviewer (W1) Level ___ Date ______	Page ___ of ___

(W1) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB #
200 EAST TANK FARM	PSP-4	7/14/03 0930	1335	03-41

COMPONENT ID 102-AZ	EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED / CONDITION
CONFIGURATION Plate TO KNUCKLE	CALIBRATED RANGE 0" TO 2.5" / TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 80.2"	REF. LEVEL CORRECTION (TRANS. CORR) Ø DB
PROCEDURE COGEMA-SVUT-INS-007.3 / REV 1	MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. TCK. .875"
FILE NAME/ITEM# HORZ. WELD/45/KNUCKLE	TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°
X_0 REF. POINT (L_0) 2ND VERT WELD EAST OF 24" RISER / Y_0 REF. POINT (W_0) ℄ OF HORZ. WELD	SCAN WIDTH 7.5"

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner	Analyst	Reviewer	Page
W. D. Purdy (signature) Level II Date 7/14/03	(signature) Level III Date 8/10/03	(N1) Level ___ Date ___	___ of ___

P-SCAN Limited

(N1) See Attached Letter From J. B. Elder

4/00

ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION: 200 EAST TANK FARM	SYSTEM: PSP-4	EXAM START: 7/8/03 0717	EXAM END: 1450	JOB #: 03-41	
COMPONENT ID: 102-AZ		EXAMINATION SURFACE: ☒ OD ☐ ID ☐ PAINTED		CONDITION	
CONFIGURATION: Plate TO KNUCKLE		CALIBRATED RANGE: 0" to 2.5"		TEMP: Amb °F	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 120"		REF. LEVEL CORRECTION (TRANS. CORR): ϕ DB			
PROCEDURE: COGEMA-SVUT-INS-007.3	REV: 1	MATERIAL TYPE: ☐ SS ☒ CS OTHER Nom. THK. .875"			
FILE NAME/ITEM#: HORZ. WELD/45/KNUCKLE A		TRANSDUCER: ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°			
X_0 REF. POINT (L_0): STARTED @ 1st VERT. WELD, EAST 24"	Y_0 REF. POINT (W_0): ℄ OF HORZ. WELD	SCAN WIDTH: 7.3"			

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS

NO CRACK LIKE INDICATIONS

Examiner: W D Purdy Level II Date 7/8/03 P-Scan Limited	Analyst: Wesley H Dew Level III Date 8/10/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

(W1) See Attached Letter From J. B. Elder

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ULTRASONIC P-SCAN DATA REPORT

Riser #90

LOCATION 200 EAST TANK FARM	SYSTEM PSP-4		EXAM START 7/8/03 0717	EXAM END 1450	JOB # 03-41
COMPONENT ID 102-AZ			EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		CONDITION
CONFIGURATION Plate TO KNUCKLE			CALIBRATED RANGE 0" TO 2.5"		TEMP Amb °F
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 46.3"			REF. LEVEL CORRECTION (TRANS. CORR) ∅ DB		
PROCEDURE COGEMA-SVUT-INS-007.3	REV 1		MATERIAL TYPE ☐ SS ☒ CS OTHER NOM. THK. .1875"		
FILE NAME/ITEM# HORZ. WELD / 45° / KNUCKLE B			TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°		
X_0 REF. POINT (L_0) START @ END OF A	Y_0 REF. POINT (W_0) ℄ OF HORZ. WELD		SCAN WIDTH 7.3"		

SIZING METHOD	ANGLE	REFERENCE CAL. SHEET	SET-UP
1 45/60 DEGREE SHEAR			
2 AATT			
3 RATT			
4 DUAL 0 DEGREE			

INDICATION INFORMATION

IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	X1	LENGTH	X2	Y1	WIDTH	Y2	INDICATION TYPE

REMARKS
NO CRACK LIKE INDICATIONS

Examiner [signature] Level II Date 7/8/03	Analyst [signature] Level III Date 8/10/03	Reviewer (W1) Level ___ Date ___	Page ___ of ___

P-Scan Limited.

(W1) See Attached Letter From J. B. Elder

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

JOb · 03-41

LOCATION 200EAST TANK Farm	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Step Block 444-99-30-004	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS .3" TO 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS 4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL # 310	COUPLANT H2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2mm	01996		Ø		DATA SEE SET
2									
3									
4									

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		5/14/03	5/14/03	5/20/03	5/20/03				
TIME		0835	1340	0735	1400				
REFLECTOR		.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"				
CH. 1	THK.1	.307	.324	.307	.301				
	THK. 2	1.002/0dB	1.017/0dB	1.004/0dB	.994/1dB				
CH. 2	THK.1	.307	.324	.307	.301				
	THK. 2	1.002/0dB	1.016/0dB	1.004/0dB	.999/2dB				
CH. 3	THK.1	.307	.324	.307	.301				
	THK. 2	1.002/0dB	1.016/0dB	1.004/0dB	.999/2dB				
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

Examiner WDPurdy Level II Date 5/14-20/03 P-Scan Limited	Examiner Level ___ Date ___	Reviewer [signature] Level III Date 8/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

JOb · 03-41

LOCATION	SYSTEM	CALIBRATION BLOCK	
200EAST TANK Farm	AZ-102 Riser 90	Step Block	444-99-30-004
PROCEDURE		THICKNESS	MATERIAL
COGEMA-SVUT-INS-007.3 Rev 1		.3" TO 1.0"	C/S
UT SYSTEM	SERIAL #	REFERENCE BLOCK	
PSP-4	206	N/A	
SOFTWARE VERSION	REV.	THICKNESS	MATERIAL
P-Scan SYS 4 1.3	2	N/A	N/A
LINEARITY DUE DATE		REFERENCE BLOCK TEMP	PYRO SN.
8/5/2003		Amb °F	N/A
SCANNER TYPE	SERIAL #	COUPLANT	BATCH #
AWS-5d	310	H_2O	N/A
SCANNER CABLE		CABLE LENGTH	CABLE #
COAX		80 FT	N/A
SIGNAL CABLE		CABLE LENGTH	CABLE #
COAX		80 FT	N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2mm	01935		Ø		DATA
2	KB	MSEB	5	8x2mm	01996		Ø		MEM
3									MEM
4									MEM

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		5/21/03	5/21/03	5/21/03	5/21/03	5/22/03	5/22/03	5/22/03	5/22/03
TIME		0810	0810	1000	1000	0735	0735	1435	1435
REFLECTOR		.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"
CH. 1	THK. 1	.307	.307	.307	.307	.307	.307	.301	.296
	THK. 2	1.002/0dB	1.002/0dB	.999/0dB	.999/1dB	1.004/0dB	1.002/0dB	.999/0dB	.996/1dB
CH. 2	THK. 1	.307	.307	.307	.307	.307	.304	.298	.292
	THK. 2	1.002/0dB	1.002/0dB	.999/1dB	1.002/1dB	1.004/0dB	1.002/0dB	.996/0dB	.993/1dB
CH. 3	THK. 1	.307	.307	.307	.307	.307	.307	.298	.292
	THK. 2	1.002/0dB	1.002/0dB	.999/1dB	1.002/1dB	1.004/0dB	1.002/0dB	.996/0dB	.993/1dB
CH. 4	THK. 1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

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P-Scan Limited			

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

Job · 03-41

LOCATION 200EAST TANK Farm	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Step Block 444-99-30-004	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS .3" TO 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS 4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL # 310	COUPLANT H2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2mm	01935		Ø		DATA SMMS
2	KB	MSEB	5	8x2mm	01996		Ø		
3									
4									

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		5/29/03	6/29/03	5/29/03	5/29/03	6/3/03	6/3/03	6/3/03	6/3/03
TIME		0755	0755	1445	1445	0720	0720	1425	1425
REFLECTOR		.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"
CH. 1	THK.1	.310	.307	.307	.301	.301	.307	.298	.298
	THK. 2	1.002/0dB	1.002/0dB	1.002/1dB	.996/1dB	.999/0dB	.999/0dB	1.004/2dB	.999/1dB
CH. 2	THK.1	.307	.307	.307	.301	.301	.307	.298	.298
	THK. 2	1.002/0dB	1.002/0dB	1.002/1dB	.996/1dB	.999/0dB	.999/0dB	.999/0dB	.999/0dB
CH. 3	THK.1	.307	.307	.307	.298	.301	.307	.292	.298
	THK. 2	1.002/0dB	1.002/0dB	1.002/1dB	.996/1dB	.999/0dB	.999/0dB	1.004/2dB	1.002/2dB
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

Examiner W D Purdy Level II Date 5/29, 6/3/03 PScan Limited	Examiner Level ___ Date ___	Reviewer [signature] Level III Date 8/4/03	Page ___ of ___

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

Job · 03-41

LOCATION: 200 EAST TANK Farm	SYSTEM: AZ-102 Riser 90	CALIBRATION BLOCK: Step Block 444-99-30-004	
PROCEDURE: COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS: .3" TO 1.0"	MATERIAL: C/S
UT SYSTEM: PSP-4	SERIAL #: 206	REFERENCE BLOCK: N/A	
SOFTWARE VERSION: P-Scan SYS 4 1.3	REV.: 2	THICKNESS: N/A	MATERIAL: N/A
LINEARITY DUE DATE: 8/5/2003		REFERENCE BLOCK TEMP: Amb °F	PYRO SN.: N/A
SCANNER TYPE: AWS-5d	SERIAL #: 310	COUPLANT: H_2O	BATCH #: N/A
SCANNER CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A
SIGNAL CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2 mm	01935		Ø		DATA
2	KB	MSEB	5	8x2 mm	01996		Ø		SEM
3									SEM
4									

INITIAL CALIBRATION		CALIBRATION CHECKS							
DATE		6/4/03	6/4/03	6/4/03	6/4/03	6/10/03	6/10/03	6/10/03	6/10/03
TIME		0745	0745	1415	1415	0717	0717	1415	1415
REFLECTOR		.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"
CH. 1	THK.1	.307	.304	.310	.304	.304	.307	.301	.307
	THK. 2	.999/0dB	.999/0dB	1.004/0dB	1.002/0dB	.999/0dB	.999/0dB	.993/0dB	.999/0dB
CH. 2	THK.1	.304	.304	.307	.304	.304	.304	.298	.304
	THK. 2	.999/0dB	.999/0dB	1.004/0dB	1.002/1dB	.999/0dB	.999/0dB	.995/0dB	.999/4dB
CH. 3	THK.1	.304	.304	.307	.304	.304	.304	.298	.304
	THK. 2	.999/0dB	.999/0dB	1.004/0dB	1.002/2dB	.999/0dB	.999/0dB	.995/0dB	.999/0dB
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

Examiner: W D Purdy Level II Date 6/4-10/03 P-Scan Limited	Examiner Level ___ Date ___	Reviewer: [signature] Level VII Date 8/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

Job.03-41

LOCATION 200EAST TANK Farm	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Step Block 444-99-30-004	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS .3" TO 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS 4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL # 310	COUPLANT H_2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2mm	01936		Ø		DATA SEE
2									
3									
4									

INITIAL CALIBRATION		CALIBRATION CHECKS								
DATE		6/11/03	6/11/03	6/16/03	6/16/03					
TIME		0710	2050	0757	1950					
REFLECTOR		.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"					
CH. 1	THK.1	.304	.304	.304	.301					
	THK. 2	1.002/0dB	1.002/1dB	.999/0dB	.996/0dB					
CH. 2	THK.1	.304	.304	.304	.301					
	THK. 2	1.002/0dB	1.002/1dB	.999/0dB	.996/1dB					
CH. 3	THK.1	.304	.304	.304	.301					
	THK. 2	1.002/0dB	1.002/1dB	.999/0dB	.996/1dB					
CH. 4	THK.1									
	THK. 2									
FILE #										
EXAMINER										

REMARKS

Examiner [signature] Level II Date 6/11+16/03 P-Scan Limited	Examiner ____ Level ___ Date ___	Reviewer [signature] Level III Date 6/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

Job-03-41

LOCATION: 200EAST TANK Farm	SYSTEM: AZ-102 Riser 90	CALIBRATION BLOCK: Step Block 444-99-30-004	
PROCEDURE: COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS: .3" TO 1.0"	MATERIAL: C/S
UT SYSTEM: PSP-4	SERIAL #: 206	REFERENCE BLOCK: N/A	
SOFTWARE VERSION: P-Scan SYS 4 1.3	REV.: 2	THICKNESS: N/A	MATERIAL: N/A
LINEARITY DUE DATE: 8/5/2003		REFERENCE BLOCK TEMP: Amb °F	PYRO SN.: N/A
SCANNER TYPE: AWS-5d	SERIAL #: 310	COUPLANT: H_2O	BATCH #: N/A
SCANNER CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A
SIGNAL CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2m	01996		Ø		DATA SEE SET
2									
3									
4									

INITIAL CALIBRATION		CALIBRATION CHECKS							
DATE		7/7/03	7/7/03	7/9/03	7/9/03	7/14/03	7/14/03		
TIME		0830	2020	0717	2040	1350	2200		
REFLECTOR		.3" To 1.0"	.3-1.0"	.3-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"		
CH. 1	THK.1	.304	.304	.301	.301	.301	.301		
	THK. 2	.999/0dB	1.004/-1dB	.999/0dB	.999/0dB	.999/0dB	.999/2dB		
CH. 2	THK.1	.304	.304	.301	.301	.301	.301		
	THK. 2	.999/0dB	1.004/-1dB	.999/0dB	1.002/0dB	.999/0dB	.999/2dB		
CH. 3	THK.1	.304	.304	.301	.301	.301	.301		
	THK. 2	.999/0dB	1.004/-1dB	.999/0dB	1.002/0dB	.999/0dB	.999/2dB		
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

Examiner: W D Purdy Level II Date 7/7-14/03 P-Scan Limited	Examiner Level ___ Date ___	Reviewer: Wesley D. [illegible] Level [illegible] Date 7/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

JOb. 03-41

LOCATION 200EAST TANK Farm	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Step Block 444-99-30-004	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS .3" TO 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS 4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL # 310	COUPLANT H_2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2mm	01996		Ø		DATA SEE FILE
2									
3									
4									

INITIAL CALIBRATION		CALIBRATION CHECKS							
DATE		7/16/03	7/16/03	7/17/03	7/17/03	7/21/03	7/21/03		
TIME		0735	2100	0725	1449	0750	2303		
REFLECTOR		.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"	.3"-1.0"		
CH. 1	THK.1	.301	.301	.301	.298	.301	.298		
	THK. 2	.999/0dB	1.002/-1dB	.999/0dB	1.004/-1dB	.999/0dB	.990/2dB		
CH. 2	THK.1	.301	.301	.301	.301	.301	.298		
	THK. 2	.999/0dB	.999/0dB	.999/0dB	.999/0dB	.999/0dB	.993/2dB		
CH. 3	THK.1	.301	.301	.301	.301	.301	.298		
	THK. 2	.999/0dB	1.004/1dB	.999/0dB	1.004/0dB	.999/0dB	.996/1dB		
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

Examiner [signature] Level II Date 7/16-21/03 P-Scan Limited	Examiner Level ___ Date ___	Reviewer [signature] Level III Date 8/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET

Job · 03-41

LOCATION: 200EAST TANK FARM	SYSTEM: AZ-102 Riser 90	CALIBRATION BLOCK: Step Block 444-99-30-004	
PROCEDURE: COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS: .3" TO 1.0"	MATERIAL: C/S
UT SYSTEM: PSP-4	SERIAL #: 206	REFERENCE BLOCK: N/A	
SOFTWARE VERSION: P-Scan SYS 4 1.3	REV.: 2	THICKNESS: N/A	MATERIAL: N/A
LINEARITY DUE DATE: 8/5/2003		REFERENCE BLOCK TEMP: Amb °F	PYRO SN.: N/A
SCANNER TYPE: AWS-5d	SERIAL #: 30	COUPLANT: H2O	BATCH #: N/A
SCANNER CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A
SIGNAL CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE
1	KB	MSEB	5	8x2mm	01935		ϕ		DATA SEE SET
2									
3									
4									

INITIAL CALIBRATION			CALIBRATION CHECKS						
DATE		8/5/03	8/5/03						
TIME		0810	1440						
REFLECTOR		.3"-1.0"	.3"-1.0"						
CH. 1	THK.1	.301	.301						
	THK. 2	.999/0dB	.996/0dB						
CH. 2	THK.1	.301	.298						
	THK. 2	.999/0dB	.996/0dB						
CH. 3	THK.1	.301	.298						
	THK. 2	.999/0dB	.996/0dB						
CH. 4	THK.1								
	THK. 2								
FILE #									
EXAMINER									

REMARKS

Examiner	Examiner	Reviewer	Page
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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

LOCATION 200 EAST TANK FARM	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Notch Block 444-94-30-001	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS-4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL #;	COUPLANT H_2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM/ACT.	WEDGE TYPE	IMAGE
1	KB	MWB	4	8x9mm	3140		45		DATA SEE SET
2	KB	MWB	4	8x9mm	3141		45		
3									
4									

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		5/20/03	5/20/03	6/11/03	6/11/03	6/16/03	6/16/03		
TIME		0740	1405	0720	2100	0805	1955		
REFLECTOR / ORRIENTATION		Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"		
CH. 1	AMPLITUDE	80%/0dB	80%/1dB	80%/0dB	80%/0dB	80%/0dB	80%/0dB		
	LOCATION	1.414	1.411	1.414	1.414	1.414	1.414		
CH. 2	AMPLITUDE	80%/0dB	80%/1dB	80%/0dB	80%/0dB	80%/0dB	80%/2dB		
	LOCATION	1.414	1.408	1.444	1.414	1.414	1.417		
CH. 3	AMPLITUDE								
	LOCATION								
CH. 4	AMPLITUDE								
	LOCATION								
FILE #									
EXAMINER									

REMARKS

Examiner W D Purdy Level II Date 5/20, 6/11, 6/16/03 P-Scan Limited	Examiner Level ___ Date ___	Reviewer [signature] Level IIA Date 8/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

LOCATION: 200 EAST TANK FARM	SYSTEM: AZ-102 Riser 90	CALIBRATION BLOCK: Notch Block 444-94-30-001	
PROCEDURE: COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS: 1.0"	MATERIAL: C/S
UT SYSTEM: PSP-4	SERIAL #: 206	REFERENCE BLOCK: N/A	
SOFTWARE VERSION: P-Scan SYS-4 1.3	REV.: 2	THICKNESS: N/A	MATERIAL: N/A
LINEARITY DUE DATE: 8/5/2003		REFERENCE BLOCK TEMP: Amb °F	PYRO SN: N/A
SCANNER TYPE: AWS-5d	SERIAL #:	COUPLANT: H_2O	BATCH #: N/A
SCANNER CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A
SIGNAL CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE
1	KB	mWB	4	8x9mm	3110		60		DATA SET
2	KB	mWB	4	8x9mm	3112		60		
3									
4									

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		5/21/03	5/21/03	5/22/03	5/22/03	5/29/03	5/29/03		
TIME		0825	1010	0740	1445	0805	1455		
REFLECTOR / ORRIENTATION		Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"		
CH. 1	AMPLITUDE	80%/0dB	80%/1dB	80%/0dB	80%/1dB	80%/0dB	80%/2dB		
	LOCATION	1.999	1.999	1.999	1.985	1.999	1.995		
CH. 2	AMPLITUDE	80%/0dB	80%/1dB	80%/0dB	80%/1dB	80%/0dB	80%/1dB		
	LOCATION	1.999	1.999	1.999	1.990	1.999	1.990		
CH. 3	AMPLITUDE								
	LOCATION								
CH. 4	AMPLITUDE								
	LOCATION								
FILE #									
EXAMINER									

REMARKS

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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

LOCATION 200 EAST TANK FARM	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Notch Block 444-99-30-001	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS-4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL #;	COUPLANT H_2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE
1	KB	MWB	4	8x9mm	3110		60		DATA SET
2	KB	MWB	4	8x9mm	3112		60		
3									
4									

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		6/3/03	6/3/03	6/4/03	6/4/03	6/10/03	6/10/03		
TIME		0735	1430	0755	1425	0730	1420		
REFLECTOR / ORRIENTATION		Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"		
CH. 1	AMPLITUDE	80%/0dB	80%/+1dB	80%/0dB	80%/0dB	80%/0dB	80%/-2dB		
	LOCATION	1.999	1.999	1.999	2.004	1.999	1.999		
CH. 2	AMPLITUDE	80%/0dB	80%/0dB	80%/0dB	80%/2dB	80%/0dB	80%/1dB		
	LOCATION	1.999	1.990	1.999	2.004	1.999	2.004		
CH. 3	AMPLITUDE								
	LOCATION								
CH. 4	AMPLITUDE								
	LOCATION								
FILE #									
EXAMINER									

REMARKS

Examiner W Brady Level II Date 6/3,4,10/03 P-Scan Limited.	Examiner Level ___ Date ______	Reviewer [signature] Level VS Date 6/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

LOCATION 200 EAST TANK FARM	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Notch Block 444-94-30-001	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS-4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL #;	COUPLANT H_2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM/ACT.	WEDGE TYPE	IMAGE
1	KB	MWB	4	8x9mm	3088		45		DATA SEE FILE
2	KB	MWB	4	8x9mm	3127		45		
3	KB	MWB	4	8x9mm	3143		45		
4	KB	MWB	4	8x9mm	3133		45		

INITIAL CALIBRATION			CALIBRATION CHECKS						
DATE		6/12/03	6/12/03						
TIME		0720	1455						
REFLECTOR / ORRIENTATION		Notch .050"	Notch .050"						
CH. 1	AMPLITUDE	80%/0dB	80%/2dB						
	LOCATION	1.414	1.420						
CH. 2	AMPLITUDE	80%/0dB	80%/-1dB						
	LOCATION	1.414	1.417						
CH. 3	AMPLITUDE	80%/0dB	80%/0dB						
	LOCATION	1.414	1.423						
CH. 4	AMPLITUDE	80%/0dB	80%/-1dB						
	LOCATION	1.414	1.420						
FILE #									
EXAMINER									

REMARKS

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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

LOCATION 200 EAST TANK FARM	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Notch Block 444-94-30-001		
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS 1.0"		MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A		
SOFTWARE VERSION P-Scan SYS-4 1.3	REV. 2	THICKNESS N/A		MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F		PYRO SN. N/A
SCANNER TYPE AWS-5d	SERIAL #: 310	COUPLANT H_2O		BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A	
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A	

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE
1	KB	MWB	4	8/9 mm	3098		45		
2	KB	MWB	4	8/9 mm	3140		45		
3	KB	MWB	4	8/9 mm	3127		45		
4	KB	MWB	4	8/9 mm	3141		45		

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		6/26/03	6/26/03	6/30/03	6/30/03	7/1/03	7/1/03		
TIME		0810	1500	1230	2010	0715	1445		
REFLECTOR / ORRIENTATION		Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"		
CH. 1	AMPLITUDE	80%/0dB	80%/-1dB	80%/0dB	80%/0dB	80%/0dB	80%/2dB		
	LOCATION	1.414	1.431	1.414	1.417	1.414	1.427		
CH. 2	AMPLITUDE	80%/0dB	80%/-2dB	80%/0dB	80%/0dB	80%/0dB	80%/-2dB		
	LOCATION	1.414	1.437	1.414	1.414	1.414	1.411		
CH. 3	AMPLITUDE	80%/0dB	80%/1dB	80%/0dB	80%/-2dB	80%/0dB	80%/1dB		
	LOCATION	1.414	1.425	1.414	1.400	1.414	1.407		
CH. 4	AMPLITUDE	80%/0dB	80%/0dB	80%/0dB	80%/-1dB	80%/0dB	80%/-2dB		
	LOCATION	1.414	1.417	1.414	1.411	1.414	1.411		
FILE #									
EXAMINER		WHD	WHD	WHD	WHD	WHD	WHD		

REMARKS

Examiner [signature] Level III Date 6/26, 30, 7/1/03	Examiner Level ___ Date ________	Reviewer Level ___ Date ________	Page ___ of ___

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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

LOCATION: 200 EAST TANK FARM	SYSTEM: AZ-102 Riser 9D	CALIBRATION BLOCK: Notch Block 444-94-30-001		
PROCEDURE: COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS: 1.0"	MATERIAL: C/S	
UT SYSTEM: PSP-4	SERIAL #: 206	REFERENCE BLOCK: N/A		
SOFTWARE VERSION: P-Scan SYS-4 1.3	REV.: 2	THICKNESS: N/A	MATERIAL: N/A	
LINEARITY DUE DATE: 8/5/2003		REFERENCE BLOCK TEMP: Amb °F	PYRO SN: N/A	
SCANNER TYPE: AWS-5d	SERIAL #: 310	COUPLANT: H_2O	BATCH #: N/A	
SCANNER CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A	
SIGNAL CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A	

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM/ACT.	WEDGE TYPE	IMAGE
1	KB	MWB	4	8x9mm	3098		45		DATA
2	KB	MWB	4	8x9mm	3140		45		
3	KB	MWB	4	8x9mm	3027		45		
4	KB	MWB	4	8x9mm	3141		45		

INITIAL CALIBRATION		CALIBRATION CHECKS								
DATE		7/8/03	7/8/03	7/14/03	7/14/03					
TIME		0717	1450	0930	1335					
REFLECTOR / ORRIENTATION		Notch .050"	Notch .050"	Notch .050"	Notch .050"					
CH. 1	AMPLITUDE	80%/0dB	80%/2dB	80%/0dB	80%/0dB					
	LOCATION	1.414	1.414	1.414	1.414					
CH. 2	AMPLITUDE	80%/0dB	80%/-1dB	80%/0dB	80%/0dB					
	LOCATION	1.414	1.414	1.414	1.411					
CH. 3	AMPLITUDE	80%/0dB	80%/-1dB	80%/0dB	80%/1dB					
	LOCATION	1.414	1.407	1.414	1.414					
CH. 4	AMPLITUDE	80%/0dB	80%/-1dB	80%/0dB	80%/0dB					
	LOCATION	1.414	1.404	1.414	1.411					
FILE #										
EXAMINER		WDP	WDP	WDP	WDP					

REMARKS

Examiner: W D Purdy [signature] Level II Date 7/8&14/03 P-SCAN LIMITED	Examiner Level ___ Date ___	Reviewer [signature] Level III Date 8/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

LOCATION 200 EAST TANK FARM	SYSTEM AZ-102 Riser 90	CALIBRATION BLOCK Notch Block 444-99-30-002	
PROCEDURE COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS 1.0"	MATERIAL C/S
UT SYSTEM PSP-4	SERIAL # 206	REFERENCE BLOCK N/A	
SOFTWARE VERSION P-Scan SYS-4 1.3	REV. 2	THICKNESS N/A	MATERIAL N/A
LINEARITY DUE DATE 8/5/2003		REFERENCE BLOCK TEMP Amb °F	PYRO SN N/A
SCANNER TYPE AWS-5d	SERIAL #;	COUPLANT H_2O	BATCH # N/A
SCANNER CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A
SIGNAL CABLE COAX		CABLE LENGTH 80 FT	CABLE # N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM/ACT.	WEDGE TYPE	IMAGE
1	KB	MWB	4	8x9mm	3143		45		DATA IN MEM
2	KB	MWB	4	8x9mm	3133		45		
3									
4									

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		7/7/03	7/7/03	7/9/03	7/9/03	7/14/03	7/14/03	7/16/03	7/16/03
TIME		0840	2033	0725	2045	1346	2205	0745	2105
REFLECTOR / ORRIENTATION		Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"	Notch .050"
CH. 1	AMPLITUDE	80%/0dB	80%/-2dB	80%/0dB	80%/-1dB	80%/0dB	80%/0dB	80%/0dB	80%/-1dB
	LOCATION	1.414	1.402	1.414	1.414	1.414	1.414	1.414	1.420
CH. 2	AMPLITUDE	80%/0dB	80%/1dB	80%/0dB	80%/1dB	80%/0dB	80%/1dB	80%/0dB	80%/-2dB
	LOCATION	1.414	1.434	1.414	1.411	1.414	1.417	1.414	1.414
CH. 3	AMPLITUDE								
	LOCATION								
CH. 4	AMPLITUDE								
	LOCATION								
FILE #									
EXAMINER									

REMARKS

Examiner W D Purdy Level II Date 7/7-16/03 P-Scan Limited	Examiner Level ___ Date ___	Reviewer [signature] Level INS Date 8/14/03	Page ___ of ___

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AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET

Job 03-41

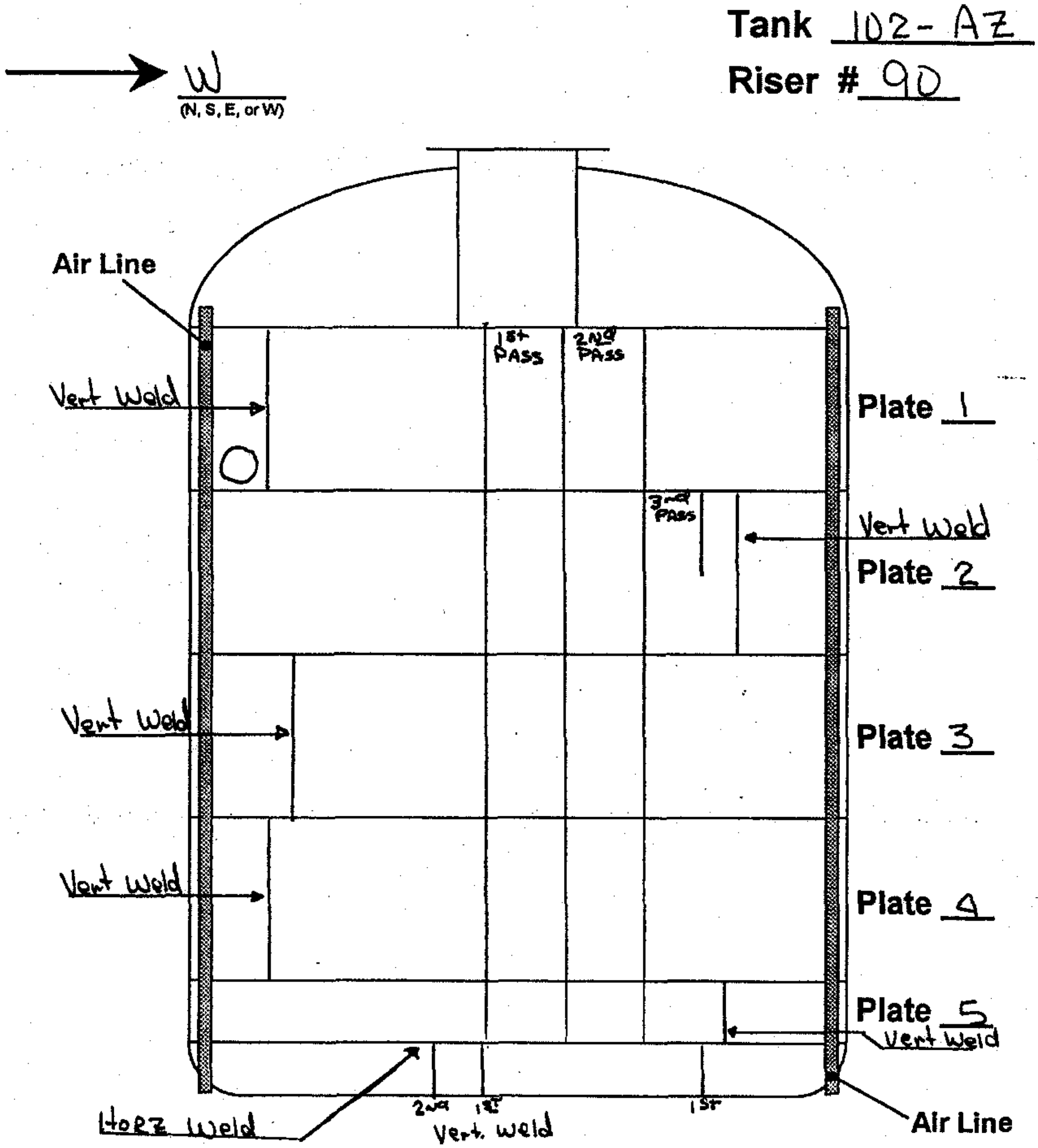
LOCATION: 200 EAST TANK FARM	SYSTEM: AZ-102 Riser 90	CALIBRATION BLOCK: Notch Block 444-94-30-002	
PROCEDURE: COGEMA-SVUT-INS-007.3 Rev 1		THICKNESS: 1.0"	MATERIAL: C/S
UT SYSTEM: PSP-4	SERIAL #: 206	REFERENCE BLOCK: N/A	
SOFTWARE VERSION: P-Scan SYS-4 1.3	REV.: 2	THICKNESS: N/A	MATERIAL: N/A
LINEARITY DUE DATE: 8/5/2003		REFERENCE BLOCK TEMP: Amb °F	PYRO SN.: N/A
SCANNER TYPE: AWS-5d	SERIAL #:	COUPLANT: H_2O	BATCH #: N/A
SCANNER CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A
SIGNAL CABLE: COAX		CABLE LENGTH: 80 FT	CABLE #: N/A

CHANNEL	TRANSDUCER MAKE	MODEL	FREQ. MHZ	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE
1	KB	MWB	4	8x9 MM	3133		45		DATA SET
2	KB	MWB	4	8x9 MM	3143		45		
3									
4									

		INITIAL CALIBRATION	CALIBRATION CHECKS						
DATE		7/23/03	7/23/03	7/24/03	7/24/03				
TIME		0835	2230	0810	1415				
REFLECTOR / ORRIENTATION		notch .050"	notch .050"	notch .050"	notch .050"				
CH. 1	AMPLITUDE	80%/0dB	80%/-1dB	80%/0dB	80%/-1dB				
	LOCATION	1.414	1.414	1.414	1.414				
CH. 2	AMPLITUDE	80%/0dB	80%/-2dB	80%/0dB	80%/1dB				
	LOCATION	1.414	1.417	1.414	1.414				
CH. 3	AMPLITUDE								
	LOCATION								
CH. 4	AMPLITUDE								
	LOCATION								
FILE #									
EXAMINER									

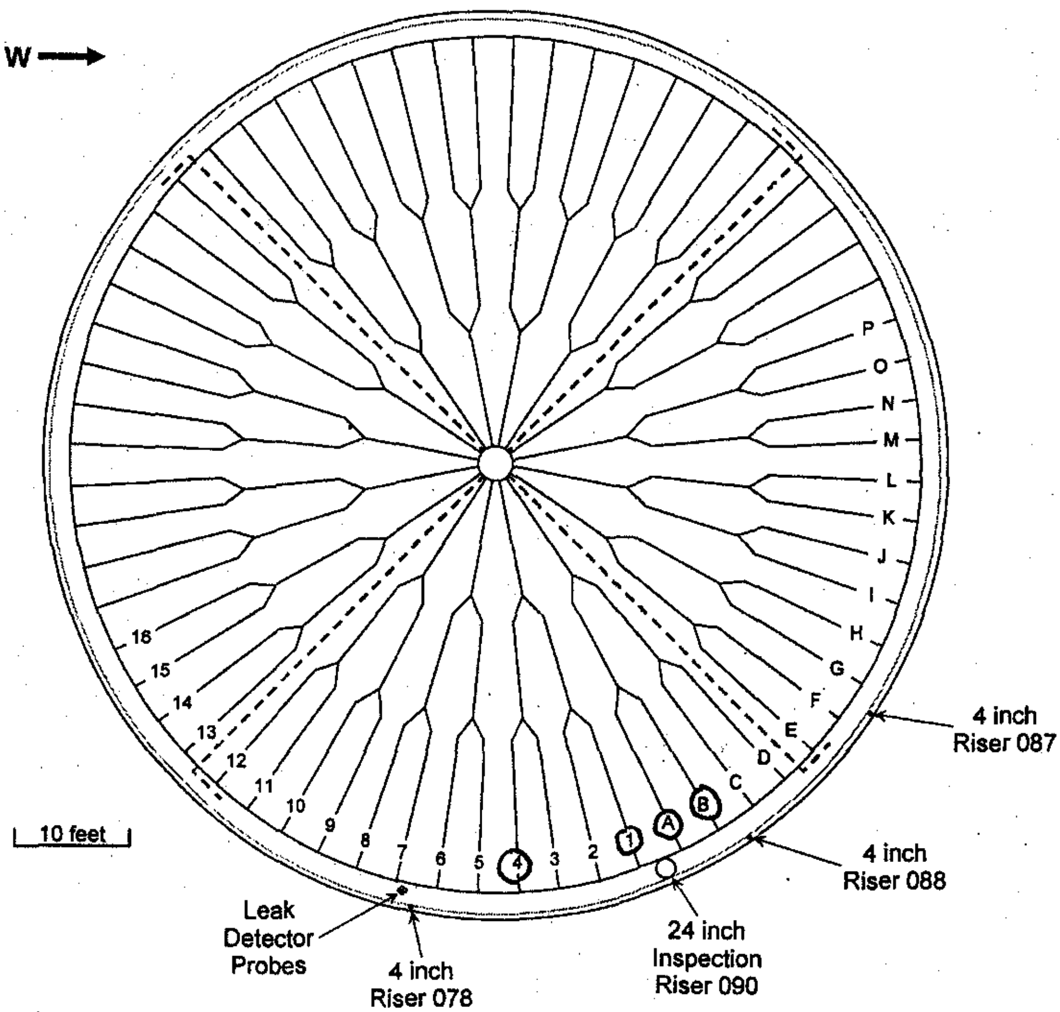
REMARKS

Examiner: W D Purdy Level II Date 7/23+24/03 P-Scan Limited	Examiner Level ___ Date ___	Reviewer: [signature] Level Date 8/14/03	Page ___ of ___



Tank 102-AZ
Riser # 90
W
(N, S, E, or W)
Air Line
Vert Weld
1st PASS
2nd PASS
Plate 1
3rd PASS
Vert Weld
Plate 2
Vert Weld
Plate 3
Vert Weld
Plate 4
Plate 5
Vert Weld
Horz Weld
2nd
1st
1st
Vert. weld
Air Line

Schematic of Air Slots Under Tank Bottom of DST 241-AZ-102



SLOT INSPECTION / Y-ARM

August 13th. 2003

Mr. Daron Tate
COGEMA Engineering Corp.
2425 Stevens Center
Richland, WA. 99352

This letter is to certify that I have analyzed the P-scan automated ultrasonic data from Hanford waste tank AZ 102. The data reviewed for the primary tank wall was collected by Mr. Nelson and Mr. Purdy May 20th. through July 24th. 2003. The data is acceptable. The data from vertical strips, vertical welds, horizontal weld, extended Y-arm knuckle scan and four slots examined with the extended Y-arm was analyzed to the requirements of COGEMA procedure SVUT-INS-007.3 Revision 1.

There are several areas that meet or exceed the 10% wall-loss criteria in Plates 1 and 2. Most of these areas are could be classified as pitting or as corrosion. Most are not reportable to the reporting criteria for pitting, but are reportable as corrosion. There are Reportable areas in the following scans:

Vertical Weld Plate 1
Vertical Wall Scan 2 Plate 2
Vertical Wall Scan 3 Plate 2 (additional 12 scan on Plate 2)

Other than the above areas, there are no reportable indications. No cracking or other reportable pitting or thinning was detected in any of the areas examined.

Sincerely,

James B. Elder
ASNT UT Level III

CC: Mr. W. H. Nelson - COGEMA

ATTACHMENT 4

COGEMA "SAFT/T-SAFT ULTRASONIC DATA REPORT SHEETS"

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ATTACHMENT 4

COGEMA "SAFT/T-SAFT ULTRASONIC DATA REPORT SHEETS"

10/02

SAFT/T-SAFT ULTRASONIC DATA REPORT

RESER 90

LOCATION	SYSTEM	EXAM START	EXAM END	JOB#
200 EAST TANK FARM	T SAFT	8/12/03	8/13/03	03-41

COMPONENT ID: 102-AZ

EXAMINATION SURFACE: ☒ OD ☐ ID

CONFIGURATION: KNUCKLE

TEMP: AMB

CIRCUMFERENCE/TOTAL LENGTH EXAMINED: 270"

PROCEDURE	REV	MATERIAL TYPE	NOM. THICKNESS
COGEMA-SVUT-INS-007.5	8	C/S	.875"

FILE NAME	TRANSDUCERS (2)	WEDGES
SEE DATA FILES	N/A	N/A

Y (CIRCUMFERENCE) START POSITION: SEE ATTACHED MAP

T-SAFT FILE NAME: SEE BELOW

T-SAFT INFORMATION

T-SAFT FILE NO.	Y START	Y STOP	X POSITION	LENGTH	DEPTH	SCANNER X POSITION
102AZ 1 THRU 19 0812		SEE ATTACHED MAP FOR LOCATIONS				
102AZ 1A THRU 1H 0813						

REMARKS

NO CRACK LIKE INDICATIONS

EXAMINER	ANALYST	REVIEWER	PAGE
[signature]	[signature]	N/A	
LEVEL III DATE 8/12-13/03	LEVEL III DATE 8/12-13/03	LEVEL ___ DATE ___	___ OF ___

10/02	SAFT/T-SAFT ULTRASONIC CALIBRATION SHEET			RISER 90
LOCATION 200 EAST TANK FARM	SYSTEM AZ ~~102-AW~~	CALIBRATION BLOCK 584-99-30-150		
PROCEDURE COGEMA-SVUT-INS-007.5	REV Ø WDN 8-14-03	THICKNESS .875"	MATERIAL C/S	
UT SYSTEM TSAFT	SERIAL # N/A	REFERENCE BLOCK N/A		
SOFTWARE VERSION SAFT-UT 2002	REV Ø	THICKNESS N/A	MATERIAL N/A	
LINEARITY DUE DATE OCT 2003		REFERENCE BLOCK TEMP AMB °F	PYRO SN. N/A	
SCANNER TYPE N/A	SERIAL # N/A	COUPLANT WATER	BATCH # N/A	
SCANNER CABLE CABLE		CABLE LENGTH 100'	CABLE # N/A	
SIGNAL CABLE COXIAL		CABLE LENGTH 100'	CABLE # N/A	

TRANSDUCER INFORMATION

TRANSDUCER #	TRANSDUCER MAKE	MODEL	FREQ	SIZE	SERIAL #	WEDGE TYPE	ANGLE
X1	KB	N9JK	3.5MHZ	.5"	W213	LUCITE	70°
X2	KB	N9JK	3.5MHZ	.5"	W243	LUCITE	70°

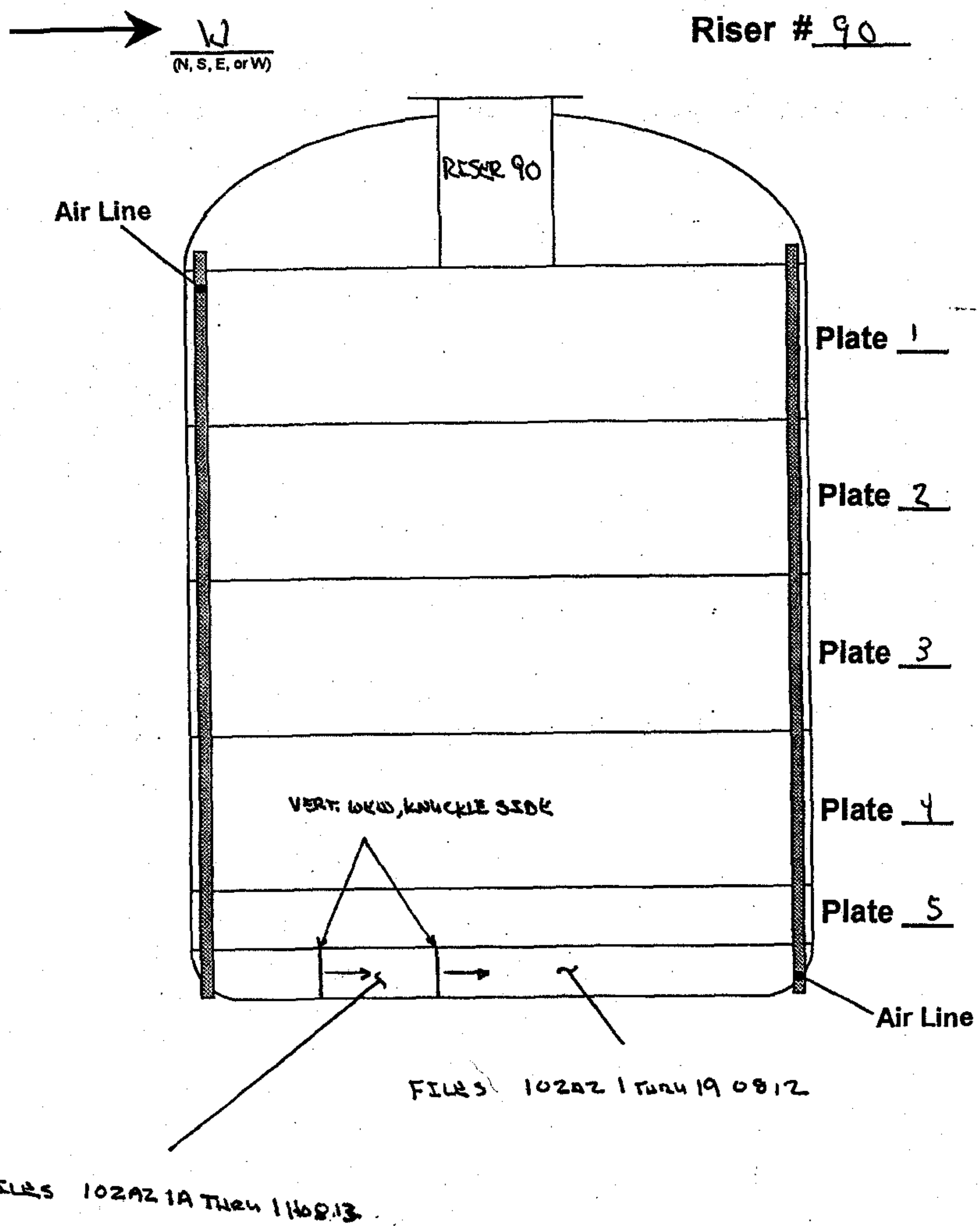
CALIBRATION CHECKS

DATE	CAL IN	CAL OUT	END OF BLOCK	NOTCH	DIFF	AMPLITUDE	DIFF	FILE NAME
8/12	0750		3.8	1.8	2.0	327		CAL081203 0750
8/12		2200	3.9	1.9	2.0	394	1.6	CAL081203 2200
8/13	0910		3.9	1.85	2.05	233		CAL081303 0910
8/13		1500	3.7	1.7	2	356	3.7	CAL081303 1500

REMARKS

EXAMINER	EXAMINER	REVIEWER	PAGE
[signature]	[signature]	N/A	
LEVEL WS DATE 8/12/03	LEVEL WS DATE 8/13/03	LEVEL ___ DATE ___	___ OF ___

Tank 102-AZ
Riser # 90



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ATTACHMENT 5

ULTRASONIC EXAMINATION OF DOUBLE-SHELL TANK 241-AZ-102 EXAMINATION COMPLETED AUGUST 2003 (PNNL THIRD PARTY REVIEW)

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PNNL-14373 Rev. 0

Ultrasonic Examination of Double-Shell Tank 241-AZ-102 Examination Completed August 2003

AF Pardini
GJ Posakony

August 2003

Prepared for
the U.S. Department of Energy
under Contract DE-AC06-76RL01830

Pacific Northwest National Laboratory
Richland, Washington 99352

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Summary

COGEMA Engineering Corporation (COGEMA), under a contract from CH2M Hill Hanford Group (CH2M Hill), has performed an ultrasonic nondestructive examination of selected portions of Double-Shell Tank 241-AZ-102. The purpose of this examination was to provide information that could be used to evaluate the integrity of the wall of the primary tank. The requirements for the ultrasonic examination of Tank 241-AZ-102 were to detect, characterize (identify, size, and locate), and record measurements made of any wall thinning, pitting, or cracks that might be present in the wall of the primary tank. Any measurements that exceed the requirements set forth in the Engineering Task Plan (ETP), RPP-11832 (Jensen 2002) and summarized on page 1 of this document, are reported to CH2M Hill and the Pacific Northwest National Laboratory (PNNL) for further evaluation. Under the contract with CH2M Hill, all data is to be recorded on disk and paper copies of all measurements are provided to PNNL for third-party evaluation. PNNL is responsible for preparing a report that describes the results of the COGEMA ultrasonic examinations.

Examination Results

The results of the examination of Tank 241-AZ-102 have been evaluated by PNNL personnel. The ultrasonic examination consisted of two 15-in. wide scans over the entire height of the tank, one short 15-in. wide scan on the top of Plate #2, and the heat-affected zone (HAZ) of five vertical welds and one horizontal weld. Utilizing the Extended-Arm (also known as Y-Arm) scanner, the examination included the upper portion of the knuckle extending down around the knuckle approximately 12-in. and portions of the lower knuckle extending down to the lower knuckle weld area (high stress region) in 4 areas accessible in the air slot openings. The examination was performed to detect any wall thinning, pitting, or cracking in the primary tank wall and knuckle. The knuckle was also examined using the Remotely Operated Nondestructive Examination (RONDE) system for circumferentially oriented cracking.

Primary Tank Wall Vertical Scan Paths

Two 15-in.-wide vertical scan paths were performed on Plates #1, #2, #3, #4, and #5. A short 15-in. wide scan was also performed adjacent to the vertical scan path #2 near the top of Plate #2. The plates were examined for wall thinning, pitting, and cracks oriented vertically on the primary tank wall. The results indicated three areas near the top of Plate #2 that exceeded the reportable level of 10% of the nominal thickness. There were no other areas of wall thinning in Plates #1, #3, #4, or #5 that exceeded the reportable level of 10% of the nominal thickness. No pitting or vertical crack-like indications were detected in Plates #1, #2, #3, #4, or #5.

Primary Tank Wall Weld Scan Paths

The HAZ of vertical welds in Plates #1, #2, #3, #4, and #5 were examined for wall thinning, pitting, and cracks oriented either perpendicular or parallel to the weld. There were three areas in the HAZ of the vertical weld in Plate #1 that exceeded the reportable level of 10% of the nominal thickness. There were no other areas of wall thinning in the HAZ of vertical welds in Plates #2, #3, #4, and #5 that exceeded the reportable level of 10% of the nominal thickness. No pitting or crack-like indications were detected in the weld HAZ areas in Plates #1, #2, #3, #4, and #5.

The HAZ of the horizontal weld between Plate #5 and the tank knuckle was examined for wall thinning, pitting and cracks oriented either perpendicular or parallel to the weld. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or crack-like indications were detected in the weld areas on Plate #5 side or on the knuckle side of the horizontal weld.

Primary Tank Knuckle Scan Paths

Extended-Arm Scanning

The upper portion of the knuckle area was scanned utilizing the Extended-Arm scanner attached to the AWS-5D crawler. The Extended-Arm scanned the transducers down around the knuckle approximately 12-in. from a starting position 2-in. down from the upper knuckle weld joining Plate #5 to the knuckle. The knuckle was examined for wall thinning, pitting, and cracks oriented circumferentially around the primary tank. There were no areas that exceeded the reportable level of 10% of the nominal thickness. No pitting or circumferentially oriented crack-like indications were detected in the upper portion of the knuckle area.

Four small areas on the lower portion of the knuckle area were examined for wall thinning only utilizing the Extended-Arm scanner in areas accessible through selected air slots. The four areas examined were in air slots designated as Slot 4, Slot1, Slot A, and Slot B. There were no areas that exceeded the reportable level of 10% of the nominal thickness.

Remotely Operated Nondestructive Examination Scanning

The results of the RONDE ultrasonic examination of the knuckle region of Tank 241-AZ-102 provided by COGEMA have been evaluated by PNNL personnel. The results of the examination of Tank 241-AZ-102 indicated no circumferential crack-like indications were present anywhere in the knuckle region between the upper knuckle weld and the lower knuckle weld over the approximately 270 circumferential inches scanned.

Contents

Figures

1.0 Introduction

COGEMA Engineering Corporation (COGEMA), under a contract from CH2M Hill Hanford Group (CH2M Hill), has performed an ultrasonic nondestructive examination (UT) of selected portions of Double-Shell Tank (DST) 241-AZ-102. The purpose of this examination was to provide information that could be used to evaluate the integrity of the DST. The requirements for the UT of Tank 241-AZ-102 were to detect, characterize (identify, size, and locate), and record measurements made of any wall thinning, pitting, or cracks that might be present in the wall of the primary tank. Any measurements that exceed the requirements set forth in the Engineering Task Plan (ETP), RPP-11832 (Jensen 2002), are reported to CH2M Hill and the Pacific Northwest National Laboratory (PNNL) for further evaluation. Specific measurements that are reported include the following:

- Wall thinning that exceeds 10% of the nominal thickness of the plate.
- Pits with depths that exceed 25% of the nominal plate thickness.
- Stress-corrosion cracks that exceed 0.10-in. (through-wall) that are detected in the inner wall of the tank, heat-affected zone (HAZ) of welds, or in the tank knuckle and tank bottom.

The accuracy requirements for ultrasonic measurements for the different types of defects are as follows:

- Wall thinning – measure thickness within ±0.020-in.
- Pits – size depths within ±0.050-in.
- Cracks – size the depth of cracks on the inner wall surfaces within ±0.1-in.
- Location – locate all reportable indications within ±1.0-in.

Under the contract with CH2M Hill, all data is to be recorded on disk and paper copies of all measurements are provided to PNNL for third-party evaluation. PNNL is responsible for preparing a report that describes the results of the COGEMA UT.

2.0 Qualified Personnel, Equipment, and Procedure

Qualification of personnel participating in the DST inspection program, the UT equipment (instrument and mechanical scanning fixture), and the UT procedure that will be used in the examination of the current DST is required by CH2M Hill. Personnel participating in the examinations are to be certified in accordance with the American Society for Nondestructive Testing (ASNT) Guideline SNT-TC-1A-92 and associated documentation is to be provided. The capability of the UT system is to be validated through a performance demonstration test (PDT) administered by PNNL on a mock-up simulating the actual DST. The current procedure for the UT is to be based on the Section V, Article 4, *Boiler and Pressure Vessel Code* defined by the American Society for Mechanical Engineers (ASME).

2.1 Personnel Qualifications

The following individuals were qualified and certified to perform UT of the Hanford DST 241-AZ-102:

- **Mr. Wesley Nelson**, ASNT Level III (#LM-1874) in UT, has been identified as COGEMA's UT Level III authority for this project. Mr. Nelson has been certified by COGEMA as a UT Level III in accordance with COGEMA procedure COGEMA-SVCP-PRC-014, latest revision. Further documentation has been provided to establish his qualifications. Reference: Letter from PNNL to C.E. Jensen dated August 22, 2000, "Report on Performance Demonstration Test – PDT, May 2000" and "SAFT/T-SAFT Performance Demonstration Test (PDT) (Mr. Wesley Nelson)," dated November 14, 2002.

- **Mr. James B. Elder**, ASNT Level III (#JM-1891) in UT, has been contracted by COGEMA to provide peer review of all DST UT data. Mr. Elder has been certified by JBNDT as a UT Level III in accordance with JBNDT written practice JBNDT-WP-1, latest revision. Further documentation has been provided to establish his qualifications. Reference: PNNL-11971, *Final Report - Ultrasonic Examination of Double-Shell Tank 241-AN-107.*

- **Mr. William D. Purdy**, COGEMA UT Level II limited (for P-Scan data acquisition only). Mr. Purdy has been certified in accordance with COGEMA procedure COGEMA-SVCP-PRC-014, latest revision. Further documentation has been provided to establish his qualifications. Reference: Letter from PNNL to C.E. Jensen dated October 5, 2001, "Purdy Performance Demonstration Test (PDT) Report."

2.2 Ultrasonic Examination Equipment

CH2M Hill has provided the UT equipment for the examination of Tank 241-AZ-102. This equipment consists of a Force Institute P-Scan ultrasonic test instrument and a Force Institute AWS-5D remote-controlled, magnetic-wheel crawler for examining the primary tank wall. Ultrasonic transducers used for the examinations are commercial off the shelf. The P-Scan ultrasonic system has been qualified through a PDT administered by PNNL. Reference: PNNL-11971, *Final Report- Ultrasonic Examination of Double-Shell Tank 241-AN-107.*

CH2M Hill and PNNL have provided the UT equipment for the examination of the knuckle region of Tank 241-AZ-102. This equipment consists of a Force Institute AWS-5D remote-controlled, magnetic-wheel crawler for transporting the PNNL RONDE scanning bridge. Ultrasonic transducers used for the examinations are commercial off the shelf. The RONDE ultrasonic system has been qualified through a PDT administered by PNNL. Reference: E-mail from Gerald J. Posakony to Susan L. Crawford and Allan F. Pardini, dated September 27, 2002, "SAFT-T-SAFT PDT."

2.3 Ultrasonic Examination Procedure

COGEMA has provided the UT procedure for the examination of Tank 241-AZ-102. This procedure, COGEMA-SVUT-INS-007.3, Revision 1, outlines the type of UT and mechanical equipment that are to be used as well as the types of transducers. Both straight-beam and angle-beam transducers are used for the examination of the primary tank wall and the HAZ of selected primary tank vertical and horizontal welds. The examination procedures include full documentation on methods for calibration, examination, and reporting. Hard copies of the T-Scan (thickness) and P-Scan (projection or angle beam) views of all areas scanned are made available for analysis. The UT procedure requires the use of specific UT transducers for the different examinations. A calibration performed before and after the examinations insures that each transducer used in the inspection is adjusted and that the entire system is performing correctly. The COGEMA UT procedure has been qualified through a PDT. Reference: PNNL-11971, *Final Report - Ultrasonic Examination of Double-Shell Tank 241-AN-107.*

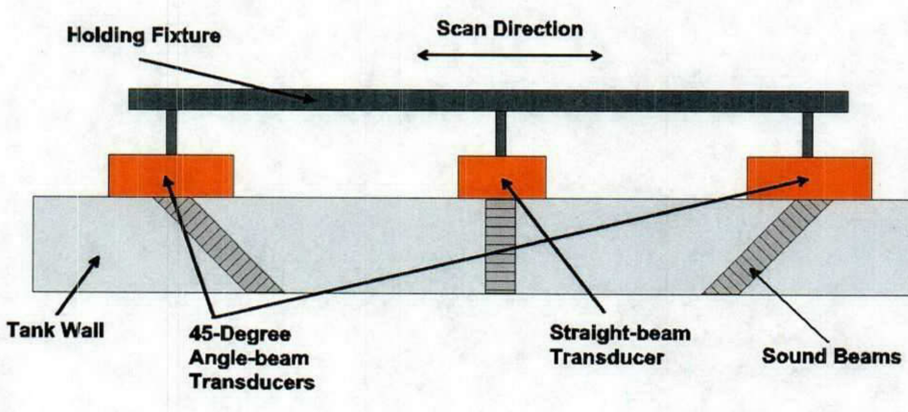
COGEMA has provided the RONDE UT procedure for the examination of Tank 241-AZ-102. This procedure, COGEMA-SVUT-INS-007.5, Revision 0, outlines the type of UT and mechanical equipment that are to be used as well as the types of transducers. Only angle-beam transducers are used for the examination of the knuckle region of the primary tank wall. The examination procedures include full documentation on methods for calibration, examination, and reporting. Hard copies of the SAFT/TSAFT views of all areas scanned are made available for analysis. The UT procedure requires the use of specific UT transducers for the knuckle examinations. A calibration performed before and after the examinations identifies the specific transducers used and the sensitivity adjustments needed to perform the inspection. The COGEMA UT procedure has been qualified through a PDT administered by PNNL. Reference: "SAFT/T-SAFT Performance Demonstration Test (PDT) (Mr. Wesley Nelson)," dated November 14, 2002.

3.0 Ultrasonic Examination Configuration

COGEMA is required to inspect selected portions of the DSTs which may include the primary and secondary tank walls, the HAZ of the primary tank vertical and horizontal welds, and the tank knuckle and bottoms. The P-Scan system has been configured to perform these examinations and has been performance tested. The examination of Tank 241-AZ-102 included UT of the primary tank wall, the HAZ of selected welds in the primary tank wall, the upper portion of the knuckle extending axially downward from the upper knuckle weld approximately 12-in., selected portions of the knuckle in the air slot openings that extend to the lower knuckle weld, the entire knuckle region for circumferentially oriented stress corrosion cracks utilizing the RONDE system, and under the tank within the air slots.

3.1 Primary Tank Wall Transducer Configuration

Figure 3.1 provides an example of the scanning configuration generally used during an examination of the primary tank wall. However, other configurations can be used at the discretion of the COGEMA UT Level III (i.e., 45-degree transducers can be removed for simple wall thickness measurements). The functional diagram in Figure 3.1 shows one straight-beam and two angle-beam transducers ganged together for examining the primary tank wall. The straight beam is designed to detect and record wall thinning and pits, and the angle beams are designed to detect and record any cracking that may be present. These transducers are attached to the scanning bridge and they all move together. Information is captured every 0.035-in. (or as set by the NDE inspector) as the assembly is scanned across a line. At the end of each scan the fixture is indexed 0.035-in. (or as set by the NDE inspector) and the scan is repeated. The mechanical scanning fixture is designed to scan a maximum of 15-in. and then index for the next scan. The hard copy provides a permanent record that is used for the subsequent analysis.



Transducer Specifications:

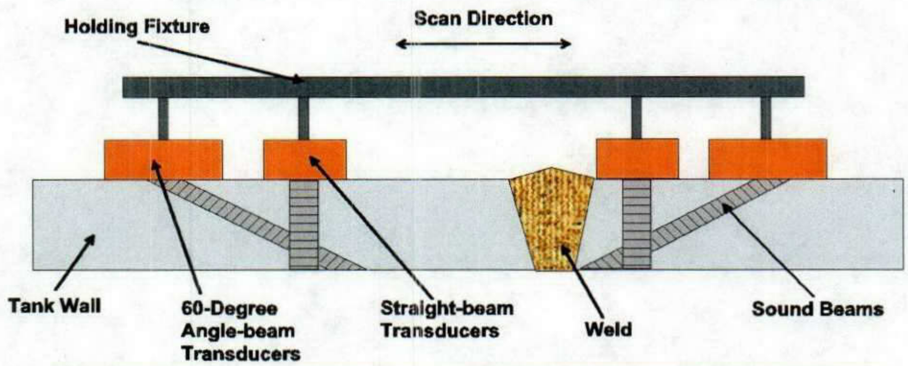
Angle-Beam
Type: MWB-45 04E
Frequency: 4 MHz
Size: 8 X 9 mm
Manufacturer: Krautkramer

Straight-Beam
Type: MSEB 5B
Frequency: 5 MHz
Size: Dual - 2 X 8 mm
Manufacturer: Krautkramer

Figure 3.1. Transducer Configuration for Examining the Primary Tank Wall

3.2 Weld Zone Transducer Configuration

Figure 3.2 is a functional sketch that shows the configurations for examination of the weld zone. The area of interest (HAZ of the weld) is shown as lying adjacent to the weld. Both cracks and pitting may occur in this region. The "A" portion of this sketch shows the 60-degree angle-beam transducers used for detecting cracks parallel to the weld. The straight-beam transducers in this sketch are used for detecting and recording any pitting or wall thinning that may be present. All transducers are ganged together. The scanning distance traveled is limited to a total of approximately 5.0-in. The sketch titled "B" shows the arrangement for detecting cracks that may lie perpendicular to the weld. Four 45-degree, angle-beam transducers are used for this inspection. Again the transducers are ganged together but the scan is limited to a total of approximately 4.0-in. The weld zone requirements are shown in Figure 3.3. The scan protocol, data capture, and index are the same for examining other weld areas in the tank.

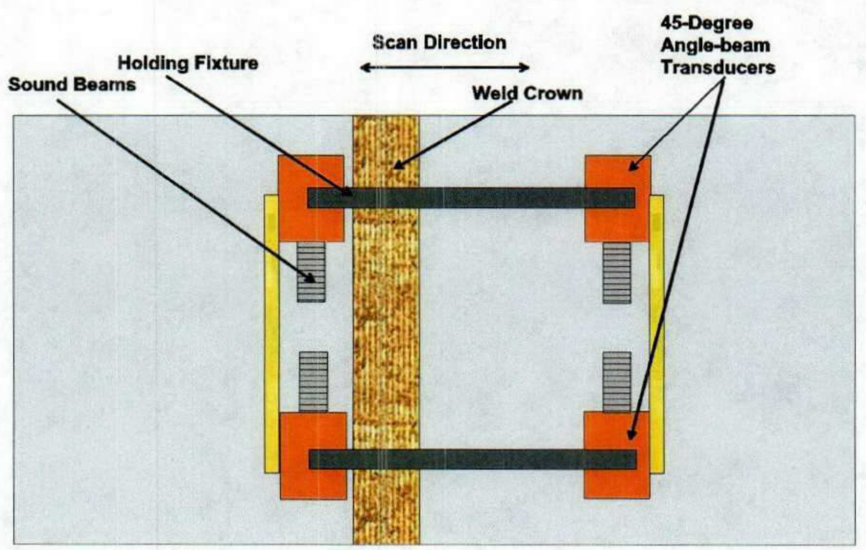


A. Configuration for pitting and cracks parallel to weld

Transducer Specifications:

Angle-Beam
Type: MWB-60 04E
Frequency: 4 MHz
Size: 8 X 9 mm
Manufacturer: Krautkramer

Straight-Beam
Type: MSEB 5B
Frequency: 5 MHz
Size: Dual - 2 X 8 mm
Manufacturer: Krautkramer



B. Configuration for cracks perpendicular to weld

Transducer Specifications:

Angle-Beam
Type: MWB-45 04E
Frequency: 4 MHz
Size: 8 X 9 mm
Manufacturer: Krautkramer

Figure 3.2. Transducer Configurations for Examination of Weld Zone in the Primary Tank Wall

In the HAZ, the requirement for characterizing cracks that lie perpendicular or parallel to welds in the primary tank wall is described in Figure 3.3. The HAZs are located on either side of the weld and defined as being within 1-in. of the toe of the weld and on the inner three-quarters of the thickness (3/4T) of the plate. These zones are considered most likely to experience stress-corrosion cracking.

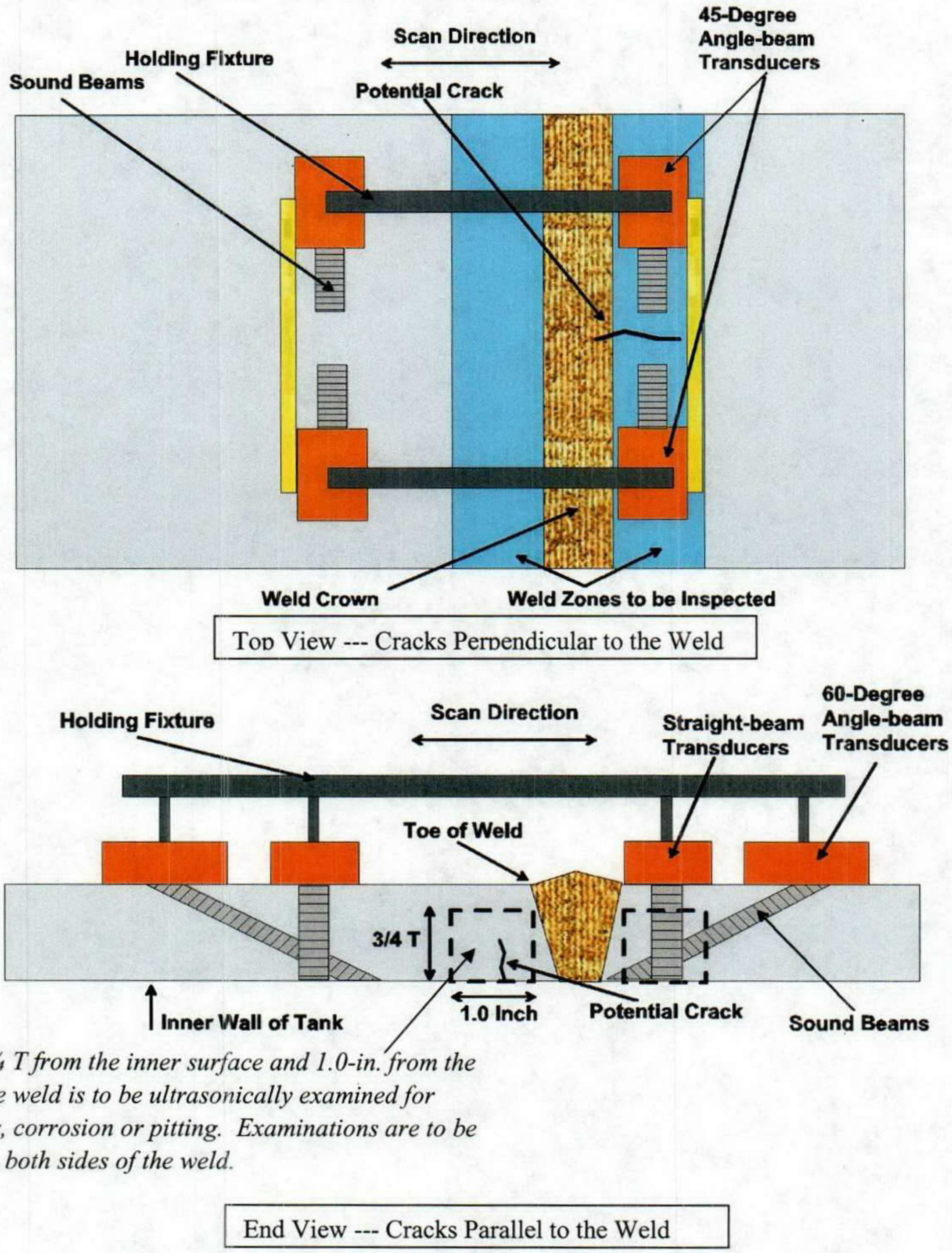


Figure 3.3. Views of the Weld Zone to be Ultrasonically Examined in the Primary Tank Wall

3.3 Knuckle Area Transducer Configuration

3.3.1 Extended-Arm Scanning System

Examination of the knuckle utilizes a modified scanning bridge known as the Extended-Arm scanner. The Extended-Arm provides scanning of the transducers directly on the knuckle region. The Extended-Arm is a special fixture that attaches to the AWS-5D magnetic wheel crawler. Its purpose is to extend the reach of the transducer assembly. This extension allows the transducer assembly to follow the curve of the upper portion of the knuckle below the transition Plate #5 to upper knuckle weld. It is designed to hold the dual 0-degree or two 45-degree transducers in the same configuration as used for the examination of the tank wall. The transducer configuration used for crack detection in this examination was two opposing 45-degree angle-beam transducers that were rotated 90-degrees from the orientation used for the wall crack inspection. This configuration is designed to detect cracks that are in a circumferential direction with respect to the axis of the tank. Figure 3.4 is a sketch showing the area of the section of the knuckle examined using the Extended-Arm fixture. With the transducer positioned 2-in. below the transition Plate #5 to upper knuckle weld, the scanning bridge was set to scan the transducer downward an additional distance of approximately 12-in. in 0.035-in steps (or as set by the operator). Upon completion of the scan, the bridge was indexed circumferentially 0.035-in. (or as set by the operator) and the scan downward is repeated to obtain a pixel size 0.035-in. x 0.035-in. (or as set by the operator).

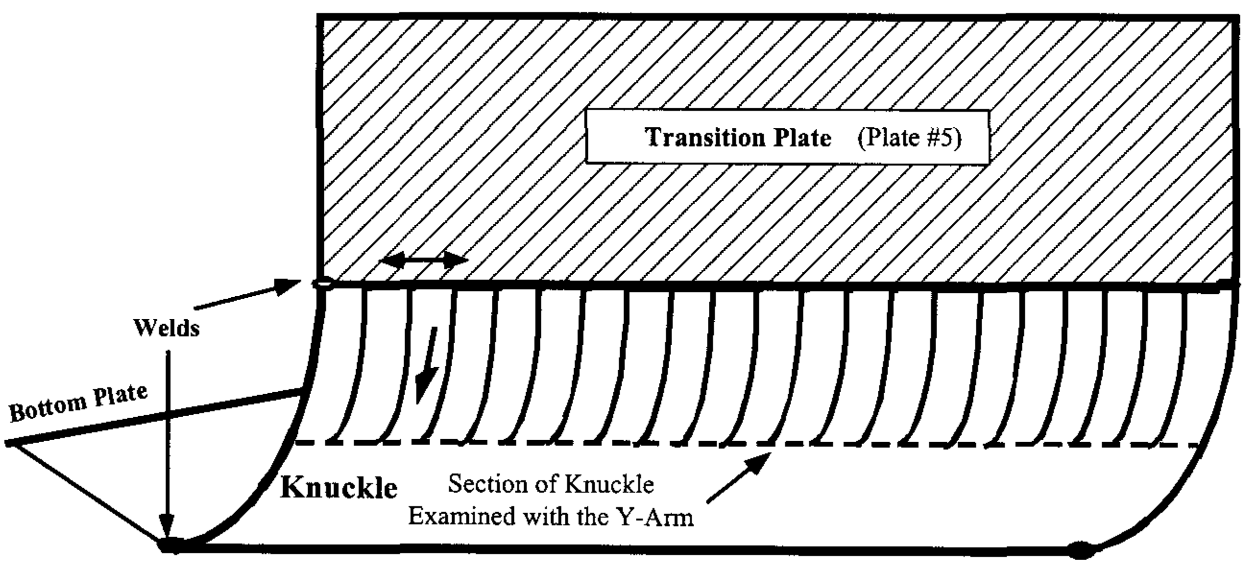


Figure 3.4. Sketch of a Section of the Knuckle Examined with the Extended-Arm Scanner

Additional Extended-Arm scanning was done on areas that were accessible in the air slots that extend under the tank in the concrete support foundation. Figure 3.5 provides an end view (looking down the air slot) and Figure 3.6 provides a side view (looking along the circumference of the tank) of the examination of the lower knuckle in the region of the air slots.

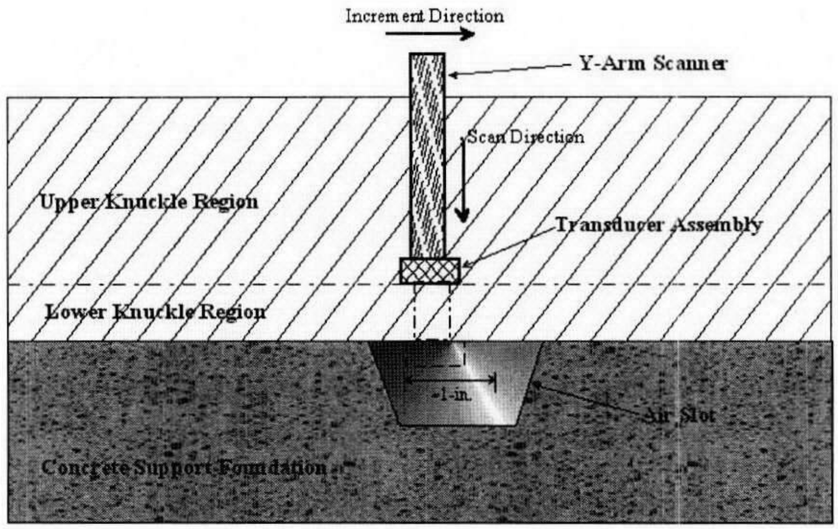


Figure 3.5. Lower Knuckle Examination in Air Slot Regions (End View)

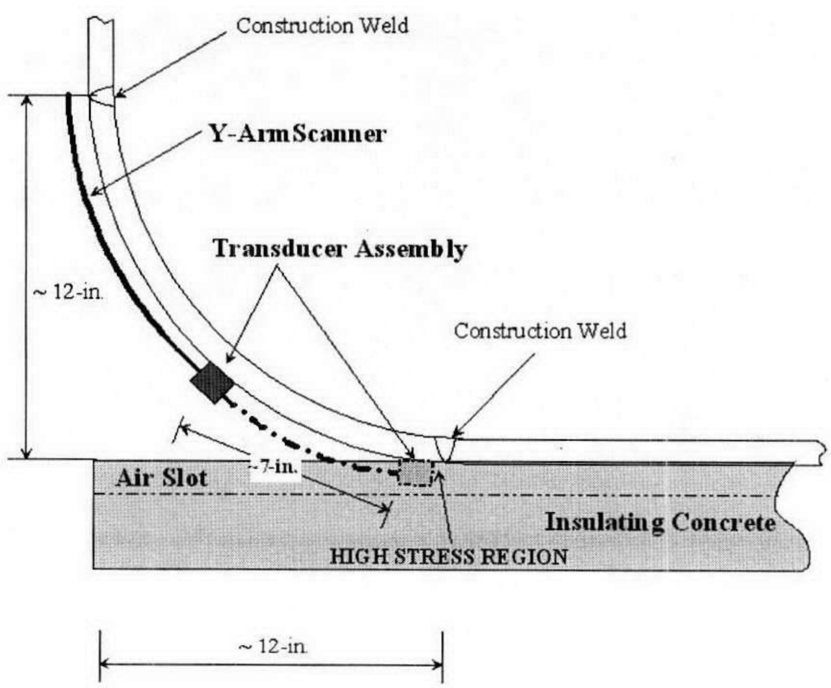


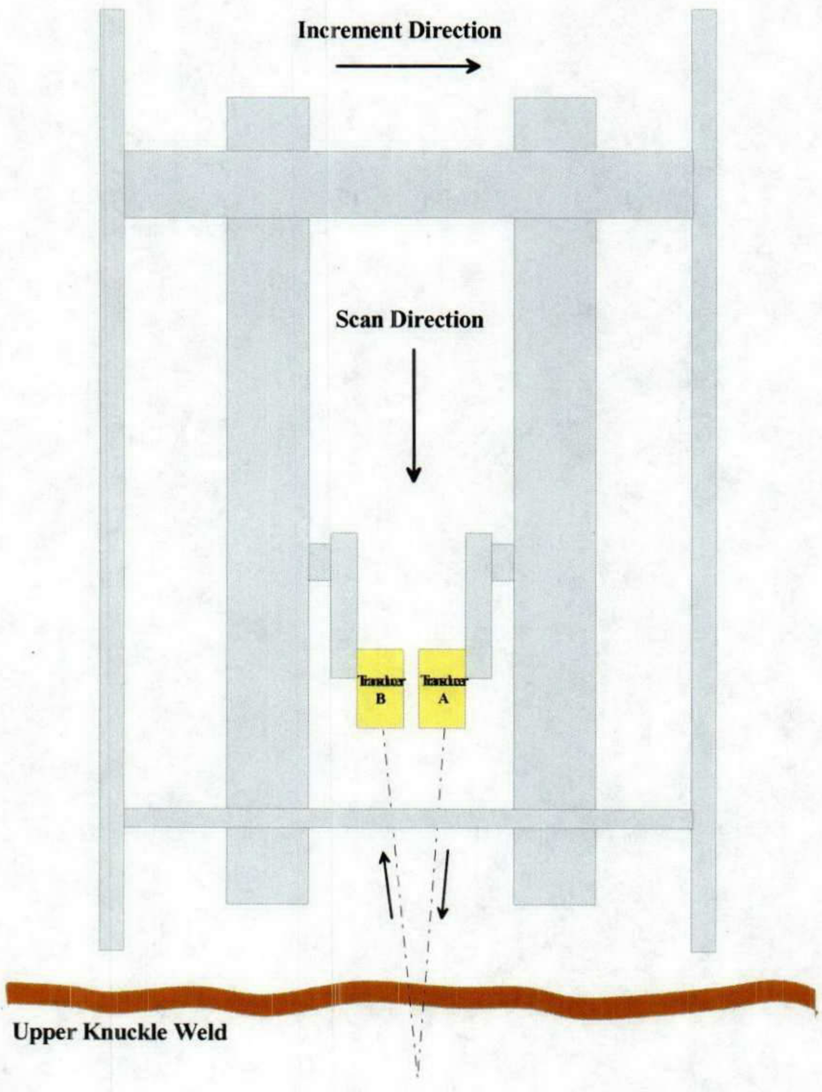
Figure 3.6. Lower Knuckle Examination in Air Slot Regions (Side View)

3.3.2 Remotely Operated Nondestructive Examination System (RONDE)

The RONDE system has been configured to perform the examination of the high stress region of the primary tank knuckle. The RONDE examination of Tank 241-AZ-102 concentrated on the knuckle region from the upper knuckle weld to the lower knuckle weld (approximately 19-in. measured on the inside diameter) and extended circumferentially around the tank approximately 270-in. Figure 3.7 provides an image of the actual equipment and configuration for the examination of the knuckle region of the primary tank and the approximate location of the scanner during normal operation.

Figure 3.7 RONDE on Test Mockup

The functional diagram in Figure 3.8 shows two 70° angle-beam transducers in a pitch-catch arrangement for examining the knuckle region of the primary tank. The angle beam transducers are designed to detect and record any circumferential cracking that may be present. These transducers are attached to the scanning bridge and can move together or individually. During crack detection scanning, the two transducers move together in unison, transducer A "pitching the sound" and transducer B "catching the sound." If a crack is detected, the two transducers are operated individually in a passing motion allowing for sizing of the detected crack. During detection scanning, information is captured every 0.025-in. (or as set by the NDE inspector) as the transducers are scanned down towards the knuckle. At the end of each scan line, the fixture is incremented 0.25-in. (or as set by the NDE inspector) and the next scan line is acquired. The mechanical scanning fixture is designed to scan the transducers approximately 10-in. by 12.5-in.; however, the sound field from the 70° transducer interrogates the entire volume of the knuckle and the C-scan (plan view) display of the data shows the entire knuckle, from the upper knuckle weld to the lower knuckle weld, and 12.5-in. in circumference. This C-scan display is immediately evaluated to identify any crack-like indications which may require additional scanning for sizing. If no crack-like indication is identified in the 12.5-in. circumferential area scan of the knuckle, the crawler transports the bridge to the next area. The hard copy C-scan view provides a permanent record that can be used for any subsequent analysis.



Transducer Specifications:
Type: MSW-QC Benchmark
Frequency: 3.5 MHz
Size: 0.5-in. Diameter
Angle: 70 degree, Wedge W-213
Manufacture: Krautkramer

Figure 3.8 General Knuckle Scanning Arrangement

4.0 Ultrasonic Examination Location

Tank 241-AZ-102 is located in the Hanford 200 East area in AZ Tank Farm. The crawler and associated scanner that hold the transducers were lowered into the 24-in. riser located on the north side of 241-AZ-102 and designated as Riser 90. Riser 90 was originally called out as Riser 18B. Figure 4.1 provides a graphic of the location of this riser.

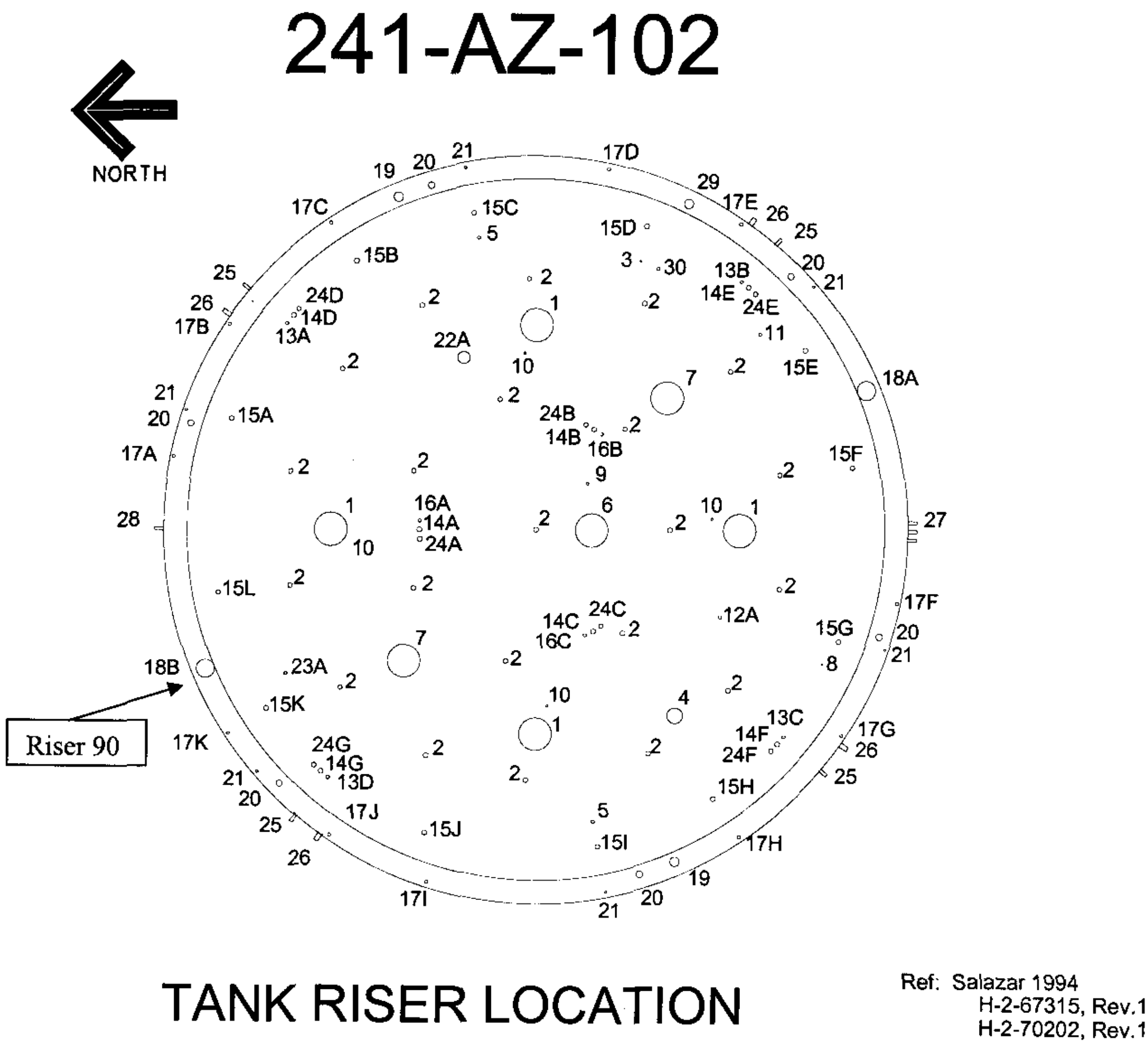


Figure 4.1. UT of 241-AZ-102 from Riser 90

Figure 4.2 describes the areas on the primary wall of Tank 241-AZ-102 that were ultrasonically examined. Two 15-in.-wide vertical scan paths were performed on Plates #1, #2, #3, #4, and #5 below the entrance to Riser 90. A short third vertical scan was performed just west of Vertical Scan #2. Vertical weld HAZ examinations were done on Plates #1, #2, #3, #4, and #5, and the horizontal weld HAZ examination was done on the transition Plate #5 to knuckle weld. Approximately 270 circumferential inches of the knuckle region was also scanned.

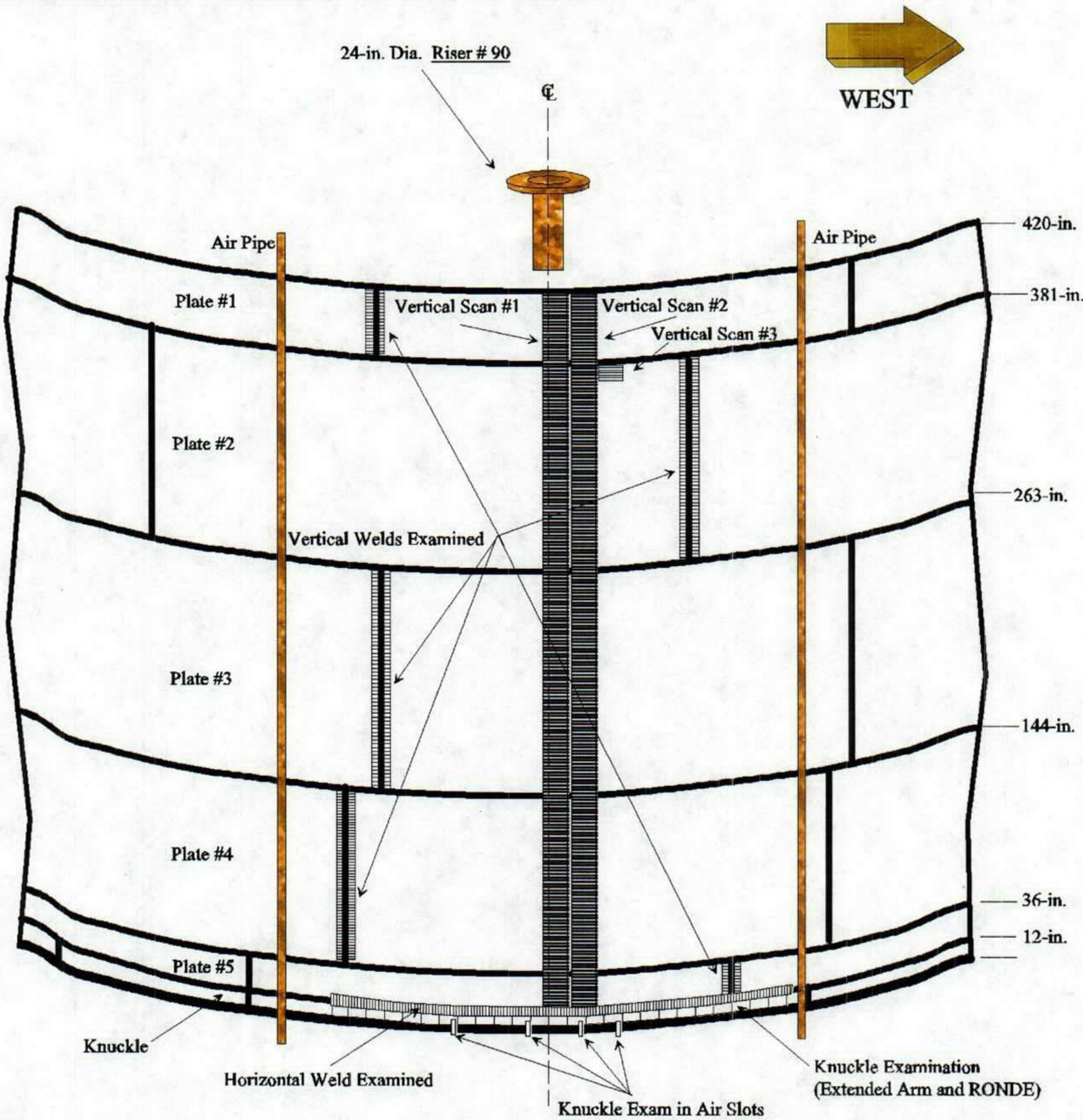


Figure 4.2. Sketch of Scan Paths on Tank 241-AZ-102

5.0 Ultrasonic Examination Results

COGEMA has provided detailed reports including T-Scan and P-Scan hard copies of all areas that were ultrasonically examined to PNNL for third-party review. The data was analyzed by COGEMA Level III Mr. Wes Nelson and peer reviewed by JBNDT Level III Mr. Jim Elder. The results of the examination of Tank 241-AZ-102 are presented in Figures 5.1, 5.2, and 5.3.

Figures 5.1 and 5.2 show the wall thickness examination results for the primary tank wall and the HAZs of both vertical and horizontal welds. The examination consisted of two vertical paths beneath the 24-in. diameter riser and one short vertical path adjacent to Vertical scan #2. Vertical scan #1 was 15-in. wide on Plates #1, #2, #3, #4, and #5 and started directly below the centerline of the 24-in. riser. Vertical scan #2 was adjacent to vertical scan #1 and was also 15-in. wide on Plates #1, #2, #3, #4, and #5. Vertical scan #3 was adjacent to vertical scan #2 and was also 15-in. wide but only extends approximately 10-in. on the top of Plate #2. The HAZs of vertical welds in Plates #1, #2, #3, #4, and #5 were examined and the HAZ in the horizontal weld between Plate #5 and the knuckle section was also examined. Areas in the figures that show two measurements in the same box are the result of the vertical scan paths overlapping the horizontal HAZ scan paths. Figures 5.1 and 5.2 display the minimum readings taken in each 15-in. wide by 12-in. long area of the scan. In the overlapping areas, both minimum readings from each of vertical and horizontal scan paths are given. Highlighted areas in Plate #1 and Plate #2 show minimum wall thickness exceeded the reportable level of 10% of the nominal thickness. The three areas in Plate #1 are in the HAZ of the vertical weld. The three areas in Plate #2 are near the end of the plate in the base metal.

Figure 5.3 shows the examination performed on the knuckle of the primary tank wall. The readings distributed around the circumference of the tank knuckle represent the minimum reading in each 12-in. long by 12-in. wide portion extending down around the knuckle. The four areas denoted as Slot 4, Slot 1, Slot A, and Slot B, represent small areas that were scanned extending down to the lower knuckle weld in the air slots. These scan areas are approximately 1-in. long (increment direction around the circumference of the tank), and 7-in wide (scan direction is down around the knuckle and into the air slot) as shown previously in Section 3 of this report.

COGEMA has provided detailed reports and data of all areas of the knuckle region on Tank 241-AZ-102 that were ultrasonically examined utilizing the RONDE system to PNNL for third-party review. The data was analyzed by COGEMA Level III Mr. Wes Nelson. Upon receipt of the data, PNNL staff members Susan Crawford and Al Pardini performed a peer review of the results.

The examination consisted of 24 individual scans, each being 12.5-in. in width (circumferential direction). The crawler was moved around the circumference in 10-in. increments, thereby providing for a 2.5-in overlap during data acquisition. The total amount of knuckle scanned was approximately 270-in. measured circumferentially around the tank. The data was displayed in a C-scan (plan) view and provided an image of the entire knuckle, from upper knuckle weld to lower knuckle weld (approximately 19-in. measured on the inside diameter), inclusive of the predicted high-stress region. Further analysis was performed on selected data files by PNNL using the SAFT analysis algorithm to verify position of the lower knuckle weld. PNNL was unable to verify that a lower knuckle weld exists on 241-AZ-102.

The results of the examination of Tank 241-AZ-102 indicated no circumferential cracking was present anywhere in the knuckle region between the upper knuckle weld and the predicted lower knuckle weld over the approximately 270 circumferential inches scanned.

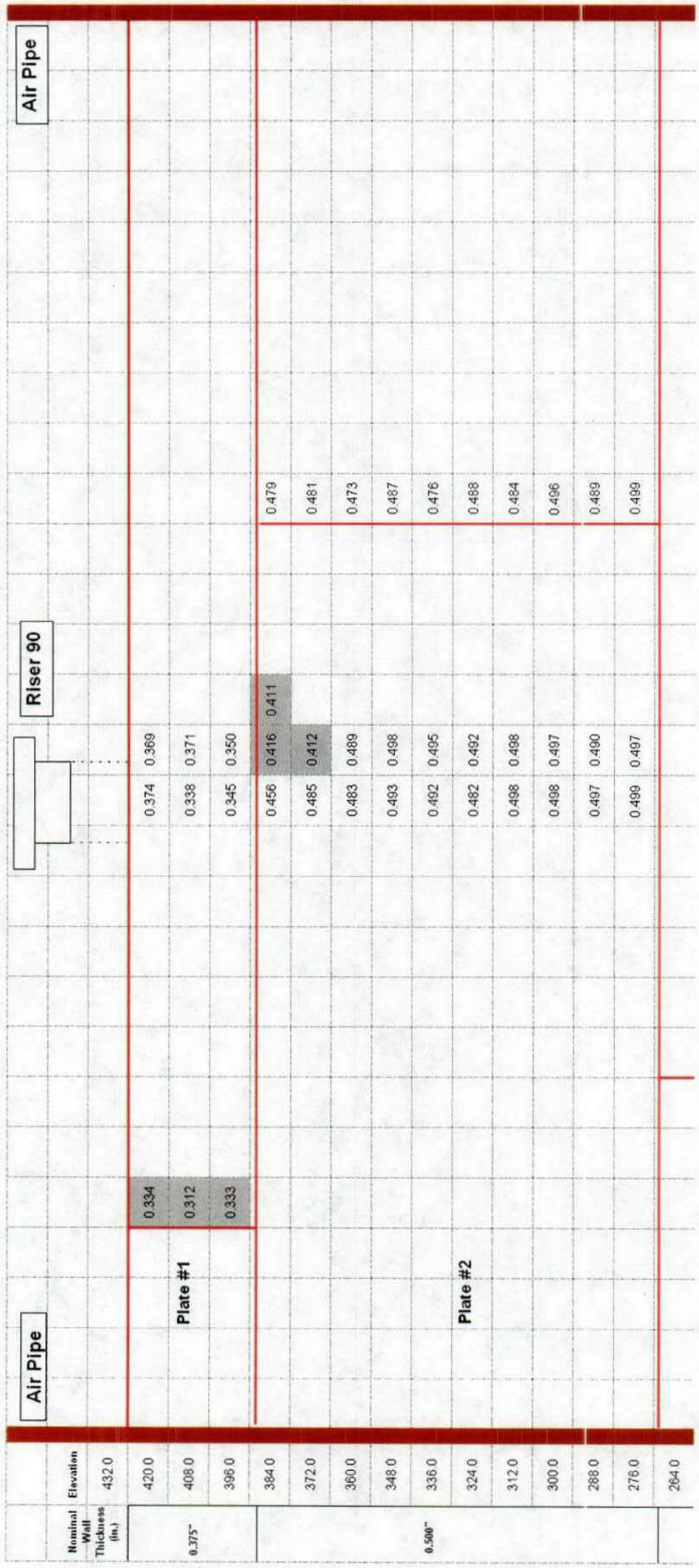


Figure 5.1. UT Data from Tank 241-AZ-102

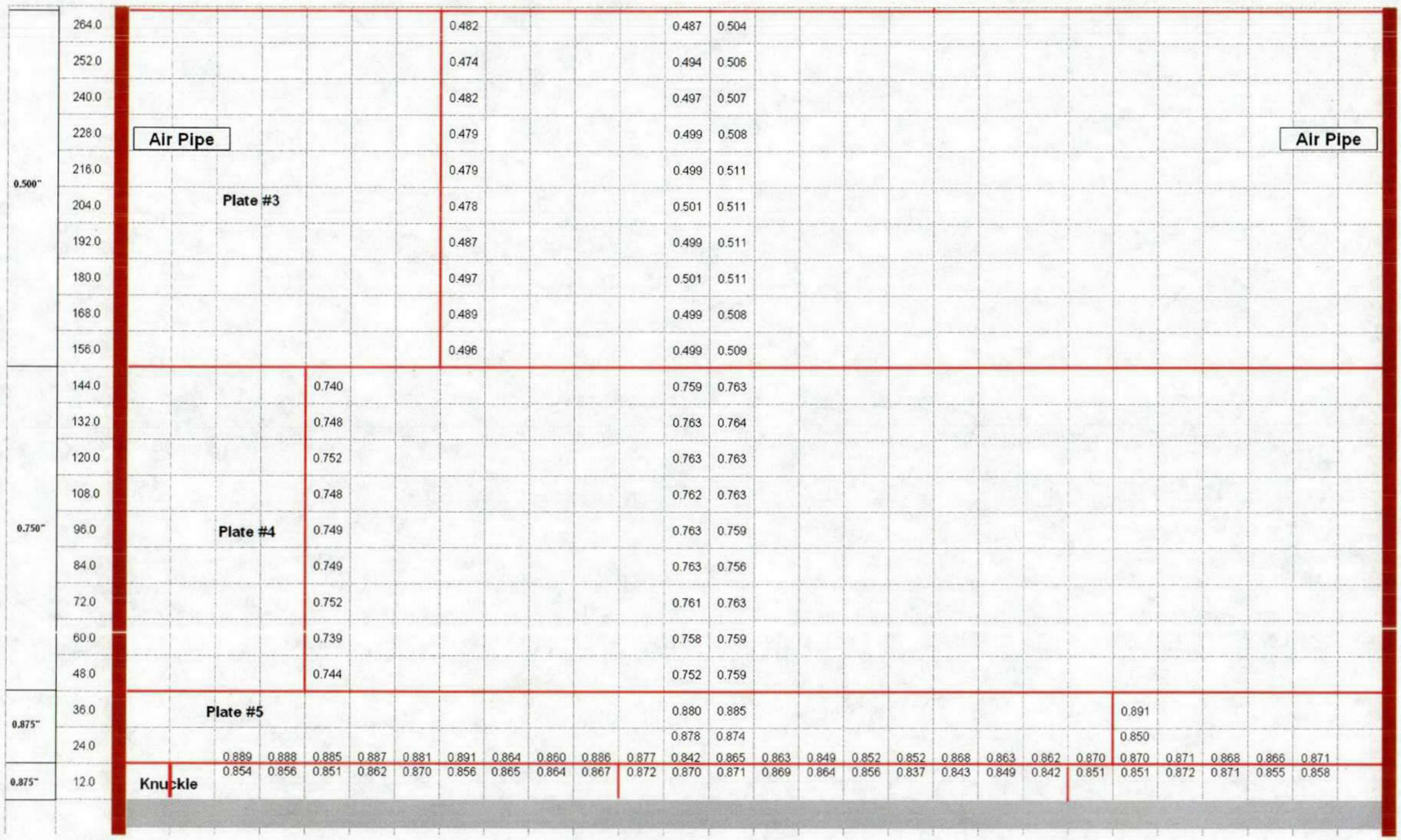


Figure 5.2 UT Data from Tank 241-AZ-102 cont.

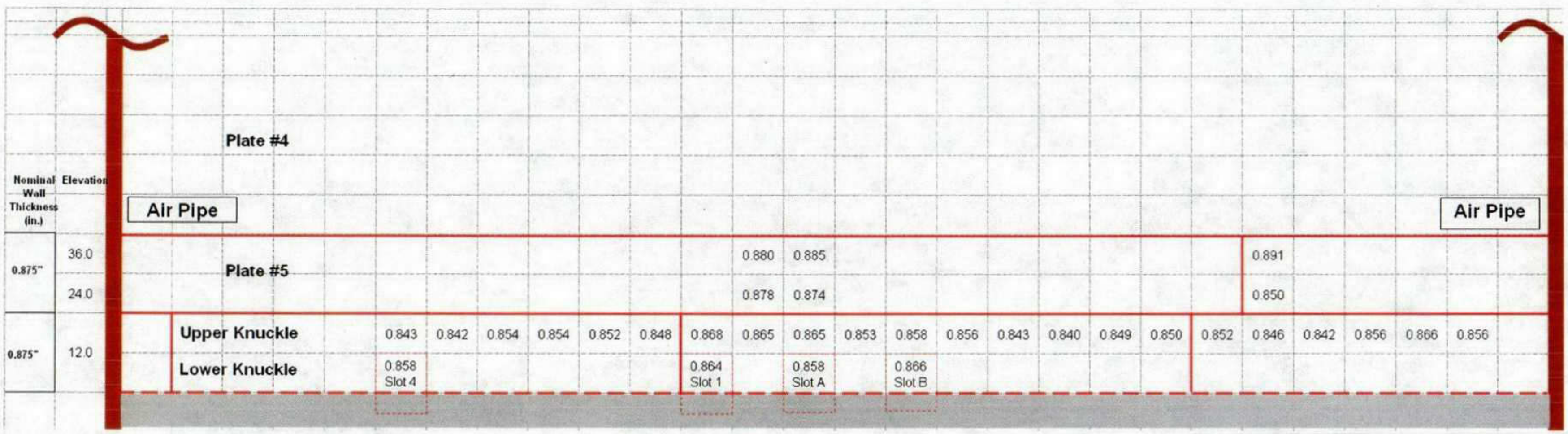


Figure 5.3 UT Data from Tank 241-AZ-102 Knuckle Region

6.0 Conclusions

The results of the examination of Tank 241-AZ-102 have been evaluated by PNNL personnel. The examination consisted of two 15-in. wide scans over the entire height of the tank, one short 15-in. wide scan on the top of Plate #2, and the HAZs of 5 vertical welds and 1 horizontal weld. Utilizing the Extended-Arm scanner, the examination included the upper portion of the knuckle extending down around the knuckle approximately 12-in. and portions of the lower knuckle extending down to the lower knuckle weld area (high stress region) in 4 areas accessible in the air slot region. The examination was performed to detect any wall thinning, pitting, or cracking in the primary tank wall and knuckle. The knuckle was also examined using the RONDE system for circumferentially oriented cracking.

6.1 Primary Tank Wall Vertical Scan Paths

Two 15-in.-wide scan paths were performed on Plates #1, #2, #3, #4, and #5 and one short 15-in. wide scan on the top of Plate #2. The plates were examined for wall thinning, pitting, and cracks oriented vertically on the primary tank wall. The results indicated that the nominal thickness in Plate #1 is 0.375-in. and the minimum thickness in this area was 0.338-in. The minimum thicknesses in the areas scanned with nominal thickness of 0.500-in. were as follows; Plate #2 was 0.411-in. and Plate #3 was 0.487-in. The nominal thickness in Plate #4 is 0.750-in. and the minimum thickness in this area was 0.752-in. The nominal thickness in Plate #5 is 0.875-in. and the minimum thickness in this area was 0.874-in. There were three areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. The areas were located near the top of Plate #2. No pitting or vertical crack-like indications were detected in Plates #1, #2, #3, #4, or #5.

6.2 Primary Tank Wall Weld Scan Paths

The HAZ of vertical welds in Plates #1, #2, #3, #4, and #5 were examined for wall thinning, pitting and cracks oriented either perpendicular or parallel to the weld. The results indicated that the minimum thicknesses in the weld areas scanned were as follows: The nominal thickness of Plate #1 is 0.375-in. and the minimum thickness in this weld area was 0.312-in. The nominal thickness of Plate #2 is 0.500-in. and the minimum thickness in this weld area was 0.473-in. The nominal thickness in Plate #3 is 0.500-in. and the minimum thickness in this weld area was 0.474-in. The nominal thickness in Plate #4 is 0.750-in. and the minimum thickness in this weld area was 0.739-in. The nominal thickness in Plate #5 is 0.875-in. and the minimum thickness in this weld area was 0.850-in. There were three areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. The areas were located in the HAZ of the vertical weld in Plate #1. No pitting or crack-like indications were detected in the weld areas in Plates #1, #2, #3, #4, or #5.

The HAZ of the horizontal weld between Plate #5 and the tank knuckle was examined for wall thinning, pitting and cracks oriented either perpendicular or parallel to the weld. The results indicated that the minimum thickness in the weld area with nominal thickness of 0.875-in. on Plate #5 was

0.842-in. The minimum thickness in the weld area with nominal thickness of 0.875-in. on the knuckle was 0.837-in. There were no areas of wall thinning that exceeded the reportable level of 10% of the nominal thickness. No pitting or crack-like indications were detected in the weld areas on Plate #5 side or on the knuckle side of the horizontal weld.

6.3 Primary Tank Knuckle Scan Paths

6.3.1 Extended-Arm Scanning

The upper portion of the knuckle area was scanned utilizing the Extended-Arm scanner attached to the AWS-5D crawler. The Extended-Arm scanned the transducers down around the knuckle approximately 12-in. from a starting position 2-in. down from the upper knuckle weld joining Plate #5 to the knuckle. The knuckle was examined for wall thinning, pitting, and cracks oriented circumferentially around the primary tank. The results indicated that the minimum thickness in the approximately 22 circumferential feet of knuckle area examined with nominal thickness of 0.875-in. was 0.840-in. There were no areas that exceeded the reportable level of 10% of the nominal thickness. No pitting or circumferentially oriented crack-like indications were detected in the upper portion of the knuckle area.

Four small areas on the lower portion of the knuckle area were examined for wall thinning utilizing the Extended-Arm scanner in areas accessible through selected air slots. The four areas examined were in air slots designated as Slot 4, Slot1, Slot A, and Slot B. The results indicated that the minimum thickness in the lower portion of the knuckle area, with nominal thickness of 0.875-in., in the selected air slots was 0.858-in. There were no areas that exceeded the reportable level of 10% of the nominal thickness.

6.3.2 Remotely Operated Nondestructive Examination Scanning

The results of the examination of the knuckle region of Tank 241-AZ-102 have been evaluated by PNNL personnel. The UT concentrated on the examination of the knuckle region from the upper knuckle weld to the lower knuckle weld (approximately 19 in. measured on the inside diameter) and extended circumferentially around the tank approximately 270 in. The data provided by the COGEMA Level III UT of the results of the examination of Tank 241-AZ-102 indicated no circumferential crack-like indications were present in the approximately 270 circumferential inches scanned of the knuckle region.

7.0 References

Jensen, C. E., 2002, *Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks FY2003*, RPP-11832, Rev 0, September 2002, CH2M Hill Hanford Group, Inc., Richland, Washington.

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